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NOTES

Medical Science and Health Poster Session
09:00 AM - 10:00 AM

BOARD 01 A HISTOLOGICAL STUDY ON HUMAN TUMORS OF THE BRAIN AND NERVOUS SYSTEM BY MEANS OF HIGH-RESOLUTION LIGHT MICROSCOPY, IMMUNOMICROSCOPY, AND ELECTRON MICROSCOPY.
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The goal of this study was to evaluate selected tumors of the brain and nervous system for unique cellular and histological features that can help with their identification. Tissue samples from ten patients presenting at Community Hospital in Springfield, Ohio, were fixed for light and electron microscopy, embedded in Spurr plastic, sectioned, stained, and viewed under both light and electron microscopes. The following tumors were evaluated by these techniques: meningioma, astrocytoma, glioblastoma multiforme, neuroblastoma, ganglioneuroblastoma, neurofibromatosis, paranganglioma, schwannoma, and phaeochromocytoma. For light microscopy selected cellular markers helpful for identification were immunostained by the application of primary antibodies conjuguated to peroxidase. These included: glial fibrillary acidic protein (GFAP) for astrocytomas and glioblastoma multiforme, estrogen and testosterone for meningiomas, and S-100 protein for neurofibromatomas. Electron microscopy was employed for identification of Luse bodies in schwannomas, GFAP in astrocytomas and glioblastoma multiforme, membrane-bound inclusion granules in ganglioneuroblastomas, and catecholamine granules in phaeochromocytomas. High-resolution light and electron microscopic images are presented, as well as markers such as Luse bodies, GFAP, and S-100, which distinguish between the tumor types.

BOARD 02 LIMB BONE STRUCTURE IN BATS VERSUS GLIDERS AND RUNNERS.
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Bats use their limbs in very different ways than do other mammals. This study examines how bat humeral and femoral structural properties differ from those of small-bodied primates, colugos, and sciurids. Midshaft cross-sectional cortical area (CA) and total subperiosteal area (TA) were calculated from radiograph measurements of wildshot museum specimens collected from all over the world. Bone lengths were also measured. Least squares regression and analysis of covariance were used to compare slopes and elevations for bivariate comparisons between different groups. Matching expectations, results indicate that bat humeri are longer and have greater CA relative to body mass than do the humeri of other mammals. However, the proportion of CA to TA is comparable to that of other animals. Also, the proportion of humeral length to midshaft CA is only slightly higher than in primates such as cebid monkeys (i.e., squirrel monkeys), and data sets overlap. Bone strength may be more important than lightness in bat wings. Bat femora are similar in the proportion of CA to length to the femora of quadrupedal primates and nongliding tree squirrels. However, the proportion of bat femoral CA to TA is unusual – their femoral cortices are thicker than those of other mammals. This may be because bat hindlimbs are very active in roosting, flying, and climbing.

BOARD 03 THE EFFECT OF BINGE DRINKING ON THE CORPUS CALLOSUM.
REBECCA L. WILSON S03.RWILSON@WITTENBERG.EDU, ANDREW M. PRETORIUS, CATHY L. PEDERSON CPEDERSON@WITTENBERG.EDU, WITTENBERG UNIVERSITY, DEPT OF BIOLOGY, SPRINGFIELD OH 45501

The corpus callosum is white matter that bridges the two brain hemispheres. Chronic male and female alcoholics show a decrease in the volume of the corpus callosum, which can lead to neuropsychological dysfunction. The hypothesis is that binge drinking, without chronic alcoholism, decreases the volume of women's corpus callosum. A Magnetic Resonance Imaging (MRI) study was performed on eight females who binge drank (consumed 3 or more drinks per session) at least once a week and eight control subjects who consumed less than one alcoholic beverage per month. All 16 participants were between the ages of 20 and 29. Those women who had experimented with hard illicit drugs or had smoked more than 50 joints in their lifetime were eliminated. 3D Brain Station was used to trace MRIs taken of each participant's brain to determine the volume of their corpus callosum. There was no significant difference between the groups for age, pack years of cigarettes smoked, total joints of marijuana smoked, or race ($p > 0.3$ for each). Univariate analysis showed no significant difference between volume of the corpus callosum in the experimental and control groups ($p=0.773$). The conflicting results between our research and previous studies may be due to our subjects not bingeing over a long enough period or not experiencing the thiamine deficiency that many chronic alcoholics suffer due to a deficient diet to fully demonstrate alcohol's detrimental effect on the corpus callosum.

BOARD 04 THE EFFECTS OF TRAUMA ON THE VOLUME OF THE PITUITARY GLAND.
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People who suffered from childhood abuse and family stress have a tendency to release more corticotropin-releasing hormone than individuals who have not experienced such stress. The hypothesis was that women who had suffered from abuse and neglect would have larger pituitary glands to account for the altered hormonal activity. Nineteen women between the ages of twenty and thirty-nine were divided into two groups. The trauma group ($n=12$) was composed of women who experienced moderate to severe levels of abuse and neglect, parental divorce, and at least two familial moves. The control group ($n=7$) had no such history of trauma. MRIs were taken for each subject and traced in *3D Brai Station*. Each slice of the pituitary gland was traced three times, the mean was computed and then added to obtain a total volume. An univariate ANOVA confirmed the difference in average abuse and neglect between groups ($p<0.001$), the number of times that the subject moved ($p<0.001$), and the number of times that the subject's mother divorced ($p<0.001$). Age, packyears of cigarettes smoked (number of years x packs/day), the number of alcoholic drinks consumed per year, and scores on the Wonderlic Personnel assessment were held constant between groups ($p \geq 0.06$ for all). The pituitary gland volumes were not significantly different between the two groups ($p=0.60$) and thus did not support the idea that childhood stress causes significant changes in the volume of the pituitary gland.

BOARD 05 ALCOHOL AND ITS EFFECTS ON THE CORPUS CALLOSUM.
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Alcohol use and abuse continues to be a major concern, as its effects are detrimental to millions of Americans. Individuals with high levels of consumption may be classified as alcohol dependent. The hypothesis of this study was that high levels of consumption would cause a decreased volume of the corpus callosum through possible demyelination of the neuronal axons. Subjects were right-handed females between the ages of 20 and 36. The subjects were divided into three groups based on drinking habits in the last year: six heavy drinkers (250-375 drinks per year), eight moderate drinkers (50-130 drinks per year), and seven light drinkers (0-6 drinks per year). MRI scans were taken for each subject and the corpus callosum was traced in1 mm slices using 3D Brainstation. Slices were then added to obtain a total volume for each subject. Using an univariate ANOVA, there were no significant differences between the groups for age, IQ, history of abuse, pack years smoking, marijuana, or major depression ($p>0.13$). While there was a designated difference between drinks per year ($p<0.001$), there was no significant difference between groups in volume of the corpus callosum ($p=0.57$) despite their different levels of alcohol consumption.

BOARD 06 ROLE OF NUCLEOTIDE EXCISION REPAIR IN MUTAGENESIS OF *ESCHERICHIA COLI* FOLLOWING CISPLATIN TREATMENT.
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DNA damage recognition and processing are achieved by the nucleotide excision repair (NER) pathway that occurs in all living organisms. The RecFOR pathway of homologous recombination (HR) repairs daughter strand gaps (DSGs) formed when DNA adducts are not repaired by NER before replication. Cisplatin is an anticancer agent that forms intrastrand-crosslinks in DNA and its efficiency is limited by the development of tumor resistances. Derivatives of *E. coli* strain CC102 (*lacZ*$^-$) defective in the NER and/or RecFOR pathway were constructed by P1 transduction to compare their resistance and mutability when treated with cisplatin. Survival was determined as percent colony forming units (cfu) of the cisplatin treated cultures relative to that at time zero. The rate of mutation in the *LacZ*$^-$ and *rpoB*$^+$ gene was determined by washing and growing the treated cells in LB to allow mutation expression, then plating for Lac$^+$ revertants on minimal media with lactose as the sole carbon source, rifampicin-resistant mutants (Rif^r) on media containing rifampicin and cell viability on glucose minimal plates. Mutation frequency for Lac$^+$ and Rif^r was calculated by dividing the respective number of mutants by the number of viable cells. Decreases in survivability were accompanied by reduced mutation rate in treated *uvrA*$^-$ and *recF*$^-$ strains compared to the Uvr$^+$, Rec$^+$ strain. The functions of both the NER and RecFOR pathway are important for resistance to cisplatin as the double mutant (*uvrA*$^-$, *recF*$^-$) was the most sensitive (N=2-4).

BOARD 07 INVESTIGATION OF POSSIBLE EFFECTS OF FRED RNAi ON THE EXPRESSION OF GENES INVOLVED IN NERVOUS SYSTEM FORMATION. KARI KENEASTER (HARALD VAESSIN VAESSIN.1@OSU.EDU THE OHIO STATE UNIVERSITY), CAPITAL UNIVERSITY, 2199 E MAIN ST, COLUMBUS OH 43209

In the developing *Drosophila melanogaster* Peripheral Nervous System (PNS), Sensory Organ Precursors (SOPs) are specified at stereotyped positions and in precise numbers in the wing disc. Fred, *friend of echunoid*, is a putative cell adhesion molecule. In this study, I have examined the possible genetic mechanism through which *fred* degradation is resulting in formation of the ectopic SOPs. Fred function was suppressed via RNA interference (RNAi) is a spatio-temporal fashion by using a *Gal 4* driver, *pannier Gal 4. pnr* Gal 4 drives the expression of the UAS-construct on the dorsal most region of the wing disc. Suppression of *fred* function results in formation of ectopic SOPs. SOPs were visualized by staining for a SOP marker *neuralized A101 lac Z*. In order to elucidate the basis of this phenotype, the expression pattern of some of the genes involved in nervous system formation were examined by comparing the staining pattern of wild type wing discs to those of UAS-*fred* RNA! Preliminary data reveals a decrease in expression levels of *Delta*, the neurogenic gene.

BOARD 08 EFFECTS OF STRESS AND EFFLUENT ON VITELLOGENIN PRODUCTION IN FATHEAD MINNOWS. KERRI B. LAWRENCE, AND NATHAN A. REUTER, (TYLER LINTON, PH.D. TLINTON@GLEC-OH.COM, KERRY CHEESMAN, PH.D. KCHEESMA@CAPITAL.EDU), CAPITAL UNIVERSITY, 2199 E MAIN ST, COLUMBUS OH 43209

Vitellogenin is a protein produced in female fish in response to estradiol production during normal cycles of oogenesis. It is also present in male fish to some extent, but is usually inactive. Vitellogenin can be used as a biomarker for measuring exposure of fish to exogenous estrogens or estrogen mimics. The effects of effluent flow, of the Jackson Pike wastewater treatment plant in Columbus, Ohio, on the production of vitellogenin are being determined in male fathead minnows. Expectations are that the amount of vitellogenin will be affected by the level of stress, because fathead minnows produce cortisol in time of stress, and the production of cortisol is known to reduce the amount of vitellogenin production. The study was begun in October of 2002, with forty male fathead minnows, ten fish per basket. Two baskets were placed in the center of the stream at the waste treatment effluent and two were placed 320 meters upstream. Fish in one basket at each site were fed twice a week in order to reduce stress and cortisol production; the other fish were not fed. Initial blood samples were taken two days after placement in the stream by sacrificing five fish from each basket. The final samples will be taken three weeks after placement. The plasma from each fish will be used in an ELISA test to measure vitellogenin levels.

BOARD 09 WHAT SENSORY CUES DO CAPUCHINS USE DURING EXTRACTIVE FORAGING? MARJORIE J. ULYAN ULYANMJ@HIRAM.EDU , MEGHAN E. HAAS, SUSAYE S. RATTIGAN, COURTNEY BUZZELL AND (KIMBERLEY A. PHILLIPS PHILLIPSK@HIRAM.EDU), DEPTS OF PSYCHOLOGY ANDBIOLOGY, PO BOX 67, HIRAM COLLEGE, HIRAM OH 44234

Sensory cues used by brown capuchins (*Cebus apella*) during extractive foraging (foraging for invertebrates embedded in woody substrates) were investigated in this experiment. Previous research in the Capuchin Lab at Hiram College, Hiram, Ohio found that captive capuchins were able to locate embedded invertebrates when visual, olfactory, and auditory cues were available. Their ability to locate embedded invertebrates was determined by presenting subjects with a foraging stimulus log. Four cavities were drilled into the underside of the foraging log; one of these cavities was randomly selected each trial and baited with three superworms. These superworms are active tropical insects that feed upon dead wood. Capuchins readily consume superworms in captivity; these insects can be considered a treat or special food. This study was modified to test if capuchins could still locate an embedded insect with only one sensory cue available. It was hypothesized that subjects would successfully locate the embedded invertebrate if only visual or acoustic information was available, but not if only olfactory information was available. When only one sensory cue was provided, subjects failed to direct significantly more investigative behavior to the baited cavity. These results suggest that a combination of sensory information is necessary for capuchins to locate an embedded invertebrate.

BOARD 10 SOCIAL LEARNING AND THE ACQUISITION OF TOOL USE IN BROWN CAPUCHIN MONKEYS (*CEBUS APELLA*). MEGHAN HAAS HAASME@HIRAM.EDU, COURTNEY BUZZELL BUZZELLCA@HIRAM.EDU, ANDREW J. KONICK KONICKAJ@HIRAM.EDU AND (KIMBERLEY A. PHILLIPS PHILLIPSK@HIRAM.EDU), HIRAM COLLEGE, DEPTS OF PSYCHOLOGY AND BIOLOGY, PO BOX 67, HIRAM OH 44234

Capuchins are the only New World Primate to engage in tool use both in the wild and in captivity. The process by which this behavior is transmitted among individuals is not fully understood. These skills may be learned individually through trial and error learning, social learning or a combination of both. This study investigated whether capuchins acquire novel tool using behavior socially or individually. Capuchins are highly social primates; it was hypothesized that a social learning environment would enhance the acquisition of new tool using behavior. The subjects were nine brown capuchins (*Cebus apella)* ranging in age and sex. Four subjects were tested individually in the presence of a female monkey who readily uses tools and who served as the demonstrator. Four additional individuals were tested in the absence of the demonstrator and served as a control. Tool using behavior was achieved when the individual successfully extracted yogurt from a tube by inserting a piece of straw into a hole on the surface of the tube. The apparatus was presented to each individual over ten trials. The rates of acquisition for the paired-learning group and the individual-learning group will be compared.

BOARD 11 DETECTION OF TRANSMISSIBLE SPONGIFORM ENCEPHALOPATHIES USING PROTEINS FOUND IN SERUM AND CEREBROSPINAL FLUID. KATHARINE M. RINGER KRINGER@WOOSTER.EDU, (DEAN FRAGA DFRAGA@WOOSTER.EDU, SRINAND SREEVATSAN SREEVATSAN.1@OSU.EDU), COLLEGE OF WOOSTER, 1189 BEALL AVE, WOOSTER OH 44691

Transmissible spongiform encephalopathies (TSEs) are a group of fatal neurologic diseases affecting both animals and humans causing a "sponge-like" degeneration of brain tissue. These diseases are associated with the accumulation of a prion protein in nerve cells that lead to death of the host. The demonstration that prions are responsible for BSE and can spread to humans has lead to urgency to develop early detection methods. From previous research, it has been shown that alterations in levels several biochemical markers that indicate neurological damage of TSEs can be detected in cerebrospinal fluid and serum of infected animals. Specifically, two proteins, 14-3-3 (gamma isoform) and S-100, have been shown to be elevated in TSEs, such as Cruetzfelt-Jakob disease. The goal of this research is to develop a panel of rapid and unambiguous diagnostic tests to detect TSEs using sheep scrapie as a model. ELISA and Western Blot based tests are under development to examine the presence of 14-3-3 and S-100 in matched samples of plasma and CSF of sheep. Positive samples were histologically confirmed cases of scrapie received from the Ohio Dept of Agriculture. Negative samples were collected from apparently normal animals from scrapie infected and scrapie free flocks at the Ohio State University in Columbus and Wooster, Ohio. The last goal of the project is to convert the double antibody sandwich ELISA systems to a standard, simple to use, lateral flow device to identify both 14-3-3 and S-100 in samples of serum and CSF of sheep potentially infected with scrapie.

BOARD 12 FUNCTIONAL ANALYSIS OF R-CADHERIN IN DEVELOPING ZEBRAFISH (*DANIO RERIO)* RETINAL GANGLION CELLS. SHANNON M. KOTRADI SKOTRAD@UAKRON.EDU, QIN LIU QLIU@UAKRON.EDU, DEPT OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908

Cadherins are Ca^{2+}-dependent cell adhesion molecules that are thought to play key roles in differentiation, segregation and compartmentalization of the vertebrate central nervous system. Most cadherins contain extracellular, transmembrane and cytoplasmic domains, all of which are necessary to mediate proper cell adhesion. While temporal and spatial expression studies have implicated R-cadherin as playing a role in developing zebrafish retinal ganglion cells (RGCs), to date there have been no functional analyses on the subject. To determine R-cadherin function in zebrafish RGC development, Reverse Transcription-Polymerase Chain Reaction and ligation techniques were used to generate a dominant negative construct (RcadΔC) that encodes for the extracellular and transmembrane domains of *R-cadherin* with a reporter gene in place of the cytoplasmic domain. Subsequently, Rcad ΔC was injected into 1-4 cell stage zebrafish embryos and transfected RGCs were detected using an antibody against the reporter gene. RcadsC transfected RGCs (n=73) had a significantly fewer average number of dendritic and axonal processes (2.63 compared to 16.54; $p<0.001$) than RGCs in the control group (n=54). Average total length of processes of RcadΔC transfected RGCs was also significantly lower than that of the control group (5.83 μm compared to 33.13 μm; $p<0.001$). These results suggest that R-cadherin plays an important role in the development and differentiation of zebrafish retinal ganglion cells.

BOARD 13 REVIEWING THE FEASIBILITY OF FUNCTIONAL INGREDIENTS IN DIABETES MANAGEMENT IN A COMMON DIET. LAURA M. WELLBERY WELLBERY10@YAHOO.COM, D.M. SPILLMAN LD/RD, PH.D, 1540 SPRING PARK WALK, CINCINNATI OH 45215

Diabetes Mellitus (DM) is one of the leading causes of death and disability. There are 17 million diagnosed cases with and additional 5.9 million undiagnosed cases just in the United States. With both insulin dependent (IDDM) and non-insulin dependent (NIDDM) diabetes the goal is to maintain a normal level of glucose in the blood. Medication

therapy is essential; however, proper nutrition (food components) is critical for glucose control. There has recently been a new hypothesis concerning food composition for the control of glucose. The idea is that glucose sparing "functional ingredients" help control glucose levels in diabetics. The objective of this project was to review a month of menus at a major university. The specific ingredients that are currently suggested as "functional foods" in diabetes control are resistant starches, fenugreek, chromium, biotin, cinnamon, ginseng, and fiber. After analysis of the menus for 30 days, which constitute the common diet for students, only four of the suggested "functional components" were found in the common diet. Fiber and resistant starches were easily found in the diet in items such as bread products. There were limited sources of biotin and chromium in items such as proteins, vegetables, and breads. However, fenugreek, cinnamon, and ginseng were almost non-existent on the menus. In addition to the importance of specific ingredients, timing and the quantity of the ingredients might also be essential for optimal glucose control.

BOARD 14 FINANCE OF AN EDUCATIONAL AND INFORMATIVE WEBSITE ON THE ROLE OF WOMEN IN THE ART OF ANCIENT GREECE. **FREDERICK JOHN KLUTH FJK@FJKLUTH.COM, 1060 DELEONE DR, KENT OH 44240-2026**

Compulsory education in the US is logically inconsistent with the nature of advertising, yet new structures on the web suggest a new look at a hypothesis that advertisers might finance educational web sites. Pay for performance companies on the web allow advertisers and advertisements to be selected easily and incorporated into a web site. But the advertisements can be isolated from the educational material with suitable pointers to the advertisements. The web site designer is advised to incorporate ads that are of interest to the users of the site. For a site on the Role of Women in the Art of Ancient Greece (http://junior.apk.net/~fjk/) a search was made of the advertisers for products that were related to ancient Greece. These ads were then incorporated into the site. For the period Jan. 1 to Oct. 31 of 2002 $173.70 was raised from 46 sales resulting from 24,285 responses to ads. The number of unique visitors was not revealed by the data but 3,682,204 impressions were recorded. Of the products sold one stands out. 26 pairs of Greek classic sandals were sold with $49.00 raised. The thus raised almost pays for the cost of server space on the web, but provides nothing to the human employee who must labor approximately half - time to maintain the site. The income gained in this way is but a fraction of the costs of maintaining such a web site, but the fact that this money can be raised at all is significant.

BOARD 15 A STUDY OF THE CAUDATE NUCLEI VOLUMES IN DEPRESSED WOMEN AND NORMAL CONTROLS. **TIFFANY M. FRANKHAUSER S03.TFRANKHAUSER@WITTENBERG.EDU, (CATHY L. PEDERSON CPEDERSON@WITTENBERG.EDU), WITTENBERG UNIVERSITY, DEPT OF BIOLOGY, PO BOX 720, SPRINGFIELD OH 45501**

Researchers have observed reductions in the volume of the caudate nuclei in people suffering from major depression. The goal of this study was to determine whether there was a significant difference in the volume of the caudate nuclei in women who were depressed compared to nondepressed controls. Twenty right-handed women ages 20 to 40 were categorized into two groups: ten subjects suffering from major depression as indicated by elevations above 88 on the *Millon Clinical Multiaxial Inventory*, and ten nondepressed controls as indicated by scores under 30 on the *Millon Clinical Multiaxial Inventory* (those with scores between 30 and 88 were eliminated from the study). Using 3D Brainstation on magnetic resonance images, three tracings were taken of the left and right caudate nuclei with a mouse-driven cursor every 2mm in transaxial slices. These values were averaged and the results summed and multiplied by two in order to approximate the total volume of the caudate nuclei. By design, there was a significant difference between groups based on depression ($p<0.001$, $n=20$). However, there was no significant difference between the group based on age, height, alcohol intake, smoking habits, or average abuse score ($p>0.171$, $n=20$). Results of the omnibus test from MANOVA show no significant difference in the left or right caudate nucleus between groups ($F(2,17)=2.174$, $p=0.144$, $Eta^2=0.204$). We conclude that the caudate nuclei volumes are not significantly reduced in depressed women as compared to normal controls.

BOARD 16 SCREENING FOR MUTANT CLONES OF CREATINE KINASE. **JENNIFER M. DLWGOSH JDLWGOSH@WOOSTER.EDU, (DEAN FRAGA DFRAGA@WOOSTER.EDU), COLLEGE OF WOOSTER, C-1412 1189 BEALL AVE, WOOSTER OH 44691**

Creatine kinase (CK) is a 86 kDa homodimer that catalyzes the reversible synthesis of adenine triphosphate (ATP) from the hydrolysis of phosphocreatine to creatine. This reaction maintains an energy buffer in a variety of cells (muscle, brain, heart, and mitochondrial) and serves as a transportation system that moves energy around the cell. By studying the structure and function of CK, we can learn how structure dictates function, as well as information about CK on a molecular level, such as the discovery of second-site suppressors. The purpose of this research project is to develop a plate assay that will easily screen for the restored activity of an inactive mutant CK. The plate assay will occur on a petri plate in which *E. coli* cells (BL-21) are induced to secrete CK. Once secreted, the protein will react with chemicals in the media to create an insoluble, purple precipitate, which indicates active CK. This will allow the researcher to rapidly screen for new mutants or second site suppressors of already characterized mutants. An enhanced pET17 clone of the CK gene is currently being constructed to facilitate the secretion of CK by cloning in secretion tag sequences. This engineered construct will be used in the development of the plate assay.

BOARD 17 DEVELOPMENT AND TESTING OF A SIMPLE AND ROBUST METHOD TO ISOLATE GENOMIC DNA FROM AVIAN BLOOD SAMPLES COLLECTED IN THE FIELD. **DEAN M. FRAGA DFRAGA@ACS.WOOSTER.EDU AND MICHAEL KERN, BIOLOGY DEPT, THE COLLEGE OF WOOSTER, WOOSTER OH 44691**

A simple and portable method was developed to collect avian blood samples from adults and nestlings in the field. The isolated genomic DNA was of sufficient quantity and quality for an accurate PCR analysis of sex or genotype. The method was used to sex Pied Flycatcher (*Ficedula hypoleuca*) nestlings and domestic turkey blood samples but the general approach should be applicable to many avian species. Avian blood samples were collected using capillary pipettes and spot dried onto S&S Isocode cards (Schleicher and Schuell). Genomic DNA was purified from the samples using a simple extraction procedure in which samples were placed in deionized water and heated to 95°C for 30 minutes to lyse the cells and release the genomic DNA into solution. The isolated genomic DNA ranged in concentration from 35 to 225 ug/mL (average = 134 ± 56 ug/mL, n=10) in a total volume of 100 uL. The isolated DNA was suitable for an accurate analysis of sex using a PCR procedure previously described. In addition, we examined several variables including the minimal amount of DNA sample needed for accurate sexing (about 1uL), the effect of varying cross-contamination on accuracy of sexing (negligible effects with 10% contamination), and the effects of typical field conditions on the quality of the DNA isolated (no effects observed).

BOARD 18 CONSTRUCTION OF YELLOW FEVER MOSQUITO EGGSHELL PROMOTER EXPRESSION SYSTEMS. **DONNA Y. HOU DYHOU@OWU.EDU, ADRIENNE E. MOCK AEMOCK@OWU.EDU, MARTEN J. EDWARDS, OHIO WESLEYAN UNIVERSITY, HWCC BOX 233, DELAWARE OH 43015**

Ovary specific gene expression was investigated in *Aedes aegypti* mosquitoes to explore ways to prevent the transmission of the LaCrosse Virus that causes pediatric viral encephalitis. The transmission of virus from the adult female mosquito to her eggs (transovarial transmission, TOT) is required for the survival and amplification of the virus in mosquito populations through the winter months. An infected female mosquito transfers the LaCrosse Virus into the oocyte through the follicular epithelium. Progress was made toward the construction of four follicle cell-specific gene expression systems. The function of this system is to express an anti-viral protein in the follicular epithelium of the mosquito in an attempt to block TOT of the virus. The promoters (15a-1 and 15a-2) normally drive the expression of two different eggshell genes post blood meal. These promoters were fused with a Red Fluorescent Protein (RFP) marker gene (Clonetech), and the human antiviral protein gene, MxA. MxA is known to interfere with viral RNA polymerase in the cytoplasm of an infected cell. The purpose of using 15a-1 and 15a-2 was to ensure the expression of both RFP and MxA in the follicular epithelium specifically post blood meal. Molecular techniques employed to make the gene fusion constructs include: restriction enzyme digests, polymerase chain reactions (PCR), cloning and transformation techniques (TA and Blunt End), gel electrophoresis for DNA separation and validation, and DNA ligations. The following constructs were generated: 15a-1.RFP, 15a-1.MxA, and 15a-2.RFP. The clones were verified by automated DNA sequencing to ensure that the constructs contained the desired promoter and gene.

BOARD 19 VARIATIONS IN THE COMPOSITION OF ORAL MICROFLORA IN ADULTS AND CHILDREN. **LUCIE KRIZOVA LLKRIZOV@CC.OWU.EDU, ANNE E. FRY AEFRY@OWU.EDU, LAURA TUHELA LMTUHELA@OWU.EDU, DEPT OF ZOOLOGY, OHIO WESLEYAN UNIVERSITY, DELAWARE OH 43015**

Natural oral microbial homeostasis is important for healthy dentition. This study investigated the variations in composition of oral microflora in children and adults based on the behavioral, age, and sex differences between and within these two groups. *Streptococcus mitis, Streptococcus salivarius, Neisseria* spp., *Lactobacillus acidophilus* and other *Lactobacillus* spp., were selected as indicator organisms. Dental biofilm samples were collected from 23 children and 23 adults. All participants were interviewed about their use of alcohol, tobacco products, and antibiotics. Bacteria from oral biofilm samples were cultured using complex and selective media in a CO_2 enriched atmosphere. *Streptococcus salivarius* was found in 20 (87%) of children's samples; however this species was present in only 15 (65%) of the sampled adults. No difference was found in *Streptococcus mitis* occurrence between the two groups. The *Lactobacillus* spp. (excluding

L. acidophilus) was predominant in children, where it was detected in nine (39%) of samples, while it was present in only three (13 %) of adults, a statistically significant difference. Alcohol and tobacco use had a significant inhibitory effect on the occurrence of *Streptococcus* spp. but not on the occurrence of the *Lactobacillus* spp. *Neisseria* was found exclusively in individuals who admitted alcohol consumption; this corresponds to high acetyl dehydrogenase activity detected in *Neisseria* spp. Food, alcohol and tobacco consumption can alter microbial balance, possibly leading to an unhealthy oral environment and increased possibility for caries formation.

BOARD 20 HELM COMMUNITY AT MIAMI UNIVERSITY, OHIO. **GARY L. HETTERICH GHETTERICH@WOH.RR.COM, ALISSA O. ARMBRUSTER, DIANA M. SPILLMAN, PO BOX 773, 215 COUNTRY CLUB, OXFORD OH 45056**

HELM community (Health Enhancement and Lifestyle Management) is a focus on a healthy and holistic approach to personal wellness. The HELM students at Miami University are educated about the seven areas of wellness. Students begin to understand their strengths, weaknesses, limitations, and capabilities. Students become involved in learning to balance their time so that they devote different amounts of time to each of the seven areas of wellness. Students learn that the choices they make will not only affect their lives, but others as well. Students are exposed to discussions, which offer different ways to handle life's problems. It is our hypothesis that HELM community will improve the quality of life for students during college and after graduation. Thirty-four out of 35 students surveyed returned questionnaires at the end of the 2002 school year. Sample questions were: 1. Do you feel you will incorporate HELMS ideas into everyday lives after graduation? Seventy-six percent said "yes". 2. Do you feel most students are happy living in the HELMS residents hall? Ninety-seven percent said "yes". 3. Do you have a better understanding of the effects that the misuse of drugs, alcohol, or tobacco can have on your life? Eighty-eight percent said "yes". Our survey clearly demonstrated that the HELM community provides a really supportive environment and encourages students to improve their quality of life. In comparison to other non-HELM dormitories the level of satisfaction is much greater in the HELM resident halls. Further, more requests are for the HELM dormitories and over the past few years more HELM communities have developed on Miami University Campus.

BOARD 21 THE EFFECTS OF *GINGKO BILOBA* (EGB 761) EXTRACT IN COMBINATION WITH COUMADIN ON HAEMOSTASIS IN *MUS MUSCULUS* (THE LABORATORY MOUSE). **HOLLIE M. REEVES H-REEVES@ONU.EDU, 11644 PARKVIEW DR, STOUTSVILLE OH 43154 OHIO NORTHERN UNIVERSITY**

This experiment evaluated the haemostatic effects of varying doses of *Gingko biloba* extract alone and in combination with Coumadin, an anticoagulant affecting g-carboxylation of the plasma coagulation proteins in *Mus musculus*. Research indicates that gingkolide B from *Gingko biloba* is an antagonist of platelet-activating factor. Platelet-activating factor plays a major role in platelet aggregation/blood coagulation. Therefore, it was hypothesized that as the concentration of *Gingko biloba* administered was increased, activation of platelets should decrease. As an anitcoagulant, Coumadin also affects hemostasis , and because many older patients often use both substances, the investigation of any synergistic effects on coagulation is important. Five treatment groups were tested with each group consisting of five adult mice. The treatment groups included: Control Group 1 receiving honey and 0.3 mL of sterile saline; Group 2 receiving 0.046 mg/day of *Gingko biloba* extract in honey and 0.3 mL of sterile saline; Group 3 receiving honey and 0.3 mL of Coumadin (2mg/100mL); Group 4 receiving 0.046 mg/day of *Gingko biloba* extract in honey and 0.3 mL of Coumadin; and Group 5 receiving 0.091 mg/day of *Gingko biloba* extract in honey and 0.3 mL of Coumadin. At the conclusion of a four-week experimental period, the prothrombin times and bleeding times for the different treatment groups were determined. The difference in mean bleeding times for each of the five treatment groups was not statistically significant upon analysis. This was expected with Coumadin treatment, as it does not directly affect platelet activation. However, the most noteworthy, but not statistically significant, differences between bleeding times occurred with the *Gingko biloba* treatment as predicted. Insufficient data prevented the statistical evaluation of the prothrombin time values. However, as expected with Coumadin treatment, the prothrombin times did increase, but surprisingly, decreased when Coumadin and *Gingko biloba* were combined. Perhaps, because Coumadin and *Gingko biloba* affect coagulation at different points in the clotting cascade, the suspected synergistic effects did not occur as hypothesized and may actually be the cause of the decrease in prothrombin time when the two were combined.

BOARD 22 THE EFFECT OF LORATADINE ON BRONCHOCONSTRICTION ASSOCIATED WITH ALLERGIC BRONCHIAL ASTHMA ASSESSED BY IN VITRO PORCINE RING FUNCTION. **MARIE J. LAMB M-LAMB@ONU.EDU, 623 E. NORTH AVE APT. A, ADA OH 45810**

Allergies produce symptoms of sneezing, runny nose, and watery eyes. Loratadine, an antihistamine which blocks H_1 receptors, is a new drug used to treat common allergic symptoms, and is reported to produce effective control of allergic asthmatic symptoms such as shortness of breath. Pig bronchial rings were used *in vitro* to determine if loratadine pre-treatment could counteract histamine-induced constriction of smooth muscle. Small bronchi (<3mm internal diameter) from six pigs were obtained from a local abbatoir. The bronchi were cut into rings and mounted in an organ chamber filled with Krebs Henseleit Bicarbonate Buffer (37° C) and gassed with 95% O_2 and 5% CO_2. Force was continually monitored through a force transducer and data acquisition system. Following equilibration, a dose response to histamine (10^{-7} M to 10^{-4}M) was established. All rings were further contracted with acetylcholine (10^{-6}M), then relaxed with isoprenaline 10^{-6} M to ensure the viability of the preparation. After wash out, half the rings were incubated with loratadine 10^{-5} M whereas the remainder received vehicle only (controls) and the dose response to histamine was repeated. Histamine contracted all segments in a dose-dependent manner during the first exposure; however, after washout control rings contracted in response to histamine, whereas loratadine-incubated rings did not. Both control and loratadine rings contracted to acetylcholine indicating that loratadine effectively inhibited histamine-induced contraction but did not affect cholinergic-mediated contraction. Therefore, loratadine pretreatment may improve symptoms associated with asthma by inhibiting allergy-induced bronchoconstriction.

BOARD 23 EFFECTS OF STRYCHNINE ON THE ANTRUM AND DUODENUM IN THE GASTROINTESTINAL TRACT OF SWINE. **AMBER FERRELL JH4EVER7997@AOL.COM, OHIO NORTHERN UNIVERSITY, 402 W COLLEGE AVE, ADA OH 45810**

Strychnine, an alkaloid poison, interacts with many receptors in the human body and particularly impacts the nervous system. In view of the fact that the gut has its own intrinsic nervous system, this project examined the effects of strychnine on the motility of the swine gastrointestinal tract. Segments of antrum and duodenum (n=eight pigs) were mounted in organ chambers containing Krebs-Henseleit bicarbonate solution and force was continually monitored through a data acquisition system. Following equilibration, acetylcholine (10^{-4}M) was added to all segments. Half the segments then received 100-fold cumulative doses of strychnine ranging from subconvulsive to lethal (10^{-7}M to 10^{-1}M respectively; estimated from clinical reports) whereas the other half received deionized water (vehicle controls). All segments responded with an increase in frequency and amplitude to acetylcholine (10^{-4}M). Paired comparisons (Students t-test, a=0.05) indicated that after strychnine addition, the antrum showed no significant changes from controls; however, frequency of contraction in strychnine segments decreased at lower doses and increased at higher doses as compared to controls, whereas the amplitude effects showed an opposite pattern. Duodenal segments had reduced contractile amplitude to all strychnine doses compared to controls, which only reached significance at the highest concentration tested (10^{-1}M). Duodenal frequency was not altered from controls. Results imply that strychnine promotes increased contraction of the antrum and decreased motility of the duodenum; which in turn, would promote gastric emptying and increase absorption in the duodenum of the swine gastrointestinal tract.

BOARD 24 THE MAJOR HISTOCOMPATIBILITY COMPLEX OF THE OWL MONKEY, *AOTUS AZARAI:* A MODEL SYSTEM FOR STUDYING MATE CHOICE. **NEELIMA SHARMA NLMSHRM@OTTERBEIN.EDU, (SIMON K. LAWRANCE SLAWRANCE@OTTERBEIN.EDU), DEPT OF LIFE SCIENCE, OTTERBEIN COLLEGE, WESTERVILLE OH 43081**

The purpose of this project is to examine the DRB region of the major histocompatibility complex (MHC) in the owl monkey (*Aotus azarai).* The monogamous social organization of *Aotus azarai* offers a unique opportunity to study the role of MHC genes in mate choice. The 16 *A. azarai* samples used in this study were collected from zoos in the United States and from wild animals living in the Chaco forest of eastern Argentina. The DRB region of the MHC was amplified from *A. azarai* DNA samples using the polymerase chain reaction (PCR). Denaturing gradient gel electrophoresis (DGGE) was used to characterize the alleles present in the amplified samples. We have successfully obtained "MHC fingerprints" from sixteen *A. azarai* samples. The DGGE analysis completed on the *A. azarai* samples reveals the presence of five distinct alleles based on gel migration. Surprisingly, identical banding patterns were observed in DGGE gels containing the wild *Aotus* family members. To determine how extensive this lack of MHC variation is, we are now collecting additional samples from different areas of the Chaco. An additional objective of this study is to characterize the nucleotide sequence of the major histocompatibilty genes of *A. azarai.* To

accomplish this we have cloned the DGGE bands into pTOPO vector and are now in the process of sequencing.

BOARD 25 CONSERVATION GENETICS: USING GENETIC TECHNOLOGY TO STUDY ENDANGERED MOUNTAIN GORILLA POPULATIONS. **ANDREA N. DENNIS ANDNDNNS@OTTERBEIN.EDU, YUNWU ZHANG, (DR. SIMON LAWRANCE SLAWRANCE@OTTERBEIN.EDU), OTTERBEIN COLLEGE, WESTERVILLE OH 43081**

Poaching, human-transmitted diseases, habitat destruction, and decreasing biodiversity threaten the future of the mountain gorillas of the Virunga Mountains of Africa. Researchers have located the primary sites of biodiversity on the genetic level, the major histocompatibility complex (MHC). MHC diversity has been found to correlate with health, behavior, and reproductive habits (i.e. mate choice). Preliminary studies have shown that the mountain gorilla population is relatively homozygous at the MHC loci when compared to humans, and this lack of diversity at the gorilla MHC genes is cause for concern and grounds for research in the area of conservation genetics. The specific objectives of my project are to isolate DNA from the non-invasive samples such as feces, amplify MHC sequences and compare them to other human and gorilla DNA samples. DNA has been successfully isolated from fifteen mountain gorilla fecal samples. PCR (polymerase chain reaction) was used to amplify mitochondrial DNA from these samples. We are currently using nested PCR to amplify MHC loci, and plan to genotype these loci using DGGE (denaturing gradient gel electrophoresis). Further, the gorilla DNA can be cloned in order to isolate the particular MHC gene from other unwanted gene sequences. Purifying the clone samples and putting them through the DNA Sequencer allows us to read the specific DNA code for any particular gorilla. This research could contribute to the big picture of genetic biodiversity in the mountain gorilla population and to the development of programs to prevent the loss of this diversity.

BOARD 26 IMMUNOCYTOCHEMICAL OBSERVATIONS OF INCREASED CONNEXIN 43 EXPRESSION IN THE NUCLEUS LAMINARIS OF CHICK EMBRYOS BETWEEN E10 AND E15 OF THEIR DEVELOPMENT. **LESLIE A. TUTTLE LSLATTTL@OTTERBEIN.EDU, LINDA ROSS, OHIO UNIVERSITY, COLLEGE OF OSTEOPATHIC MEDICINE, AMY JESSEN-MARSHALL, OTTERBEIN COLLEGE, 204 W MAIN ST., WESTERVILLE OH 43081**

Many inherited deafness disorders are believed to be associated with abnormalities in early auditory development. Nervous system development requires more axons to be sent out to the target sensory nuclei than necessary to ensure the proper connections are made. Once innervation from the periphery is complete, the extra axons are removed via programmed cell death, or apoptosis. Cell communication must occur to achieve the correct orientation and to signal cells to die. Gap junctions are a collection of channels that allow messages to pass between the cytoplasm of adjacent cells. The connexins are the integral membrane proteins that make up gap junctions, and they can be categorized according to size. Connexin 43, the form studied, has a size of 43-kDa. Previous research showed that cells in the brain are often found in clusters, die synchronously, and neighboring cells are coupled by gap junctions. We hypothesized that brain cells signal apoptosis via gap junctions. Using mmunocytochemistry, connexin 43 was labeled and examined in the nucleus laminaris and nucleus magnocellularis in chicks at embryonic development days of 10, 12, 14, 16, and 18. Connexin 43 was expressed in nucleus laminaris during the period E10-E15 when 75% of the neurons are dying and the protein is not expressed after the mass cell death. Nucleus magnocellularis acted as a positive control because it showed temporal selectivity but did not undergo apoptosis during a defined period. Results indicate that the communication by connexin 43 gap junctions may play a key role in nucleus laminaris cell death determination.

BOARD 27 THE EFFECT OF CHARGED AMINO ACID MUTATIONS IN HYDROPHOBIC TRANSMEMBRANE DOMAIN III IN THE LACTOSE PERMEASE OF *ESCHERICHIA COLI*. **CHRISTOPHER J. WALLACE (AMY E. JESSEN-MARSHALL AJESSEN-MARSHALL @OTTERBEIN.EDU), DEPT OF LIFE AND EARTH SCIENCES, OTTERBEIN COLLEGE, WESTERVILLE OH 43081-1468**

All cells require a mechanism to transport bulky or polar nutrients and wastes across hydrophobic, nonpolar membranes. Based on genetic and biochemical study, the lactose permease of *Escherichia coli* is a model system for this research. The secondary protein structural model, based on hydrophobicity plots, proposes twelve α helices that cross the bilayer. Eight are predicted to be amphipathic, and form the pore itself. The remaining four are believed to be completely hydrophobic, and are proposed to be embedded in the membrane in itself as anchors. Site directed mutagenesis in Helix III, an anchoring helix, was used to substitute charged amino acids for hydrophobic ones in positions 85, 86 and 87. These mutants were screened for functionality on 1% and 0.2% melibiose MacConkey media based on qualitative color change. A 100% function yields a red phenotype; white colonies indicate no function at all. Pink colonies indicate functional activity between 10%-30%. The functional mutants were then verified by using an automated gene sequencer. Additional characterization of these mutants was done in three replication by ONPG (o- nitro-phenyl-galactoside) spectrophotometric assays providing quantitative measurements that disruption of the hydrophobic transmembrane helices disrupts function of the protein. The four anchoring helices have not been shown to play an active role in the binding of either protons or lactose during symport. Thus, the characterization of this helix and the affect on function provides further evidence for a role in global conformational stability.

BOARD 28 ANALYSIS OF THE MHC CLASS II I-AG7 BINDING PEPTIDES IN NOD AND NOD.EAᵖ MICE. **MARISSA R. MATARRESE S03.MMATARRESE@WITTENBERG.EDU, (MATTHEW S. HANSON MHANSON@WITTENBERG.EDU), WITTENBERG UNIVERSITY, 508 ½ N. WITTENBERG AV, SPRINGFIELD OH 45501**

Insulin Dependent Diabetes Mellitus (IDDM) is an autoimmune disorder that destroys the body's ability to produce insulin, a molecule that regulates blood glucose levels. Destruction occurs when the T cell receptor and co-receptor molecules interact with an autoangtigen present in the binding cleft of an MHC class II molecule on the surface of host cell tissue. The T cell erroneously marks the autoantigen as being pathogenic, initiating a cascade that induces destruction of the non-regenerative insulin-producing beta cells of the pancreas. In non-obese diabetic (NOD) mice, the expression of only I-Ag7 MHC class II molecules is attributed to the spontaneous development of IDDM. The NOD.Ead mouse is genetically identical to the NOD mouse, except for the expression of I-E, an additional type of MHC class II molecule. This mouse strain is diabetes resistant. We hypothesize that the peptides presented by the I-Ag7 molecule differ when the I-E molecule is also present. To assess the I-E protective mechanism, peptide-bound MHC class II molecules were purified from a minimum of 35 animals from both the NOD and NOD.Ead mouse strains using affinity column chromatography. The eluent was treated with trifluoroacetic acid to release the peptides from the binding cleft of the MHC class II I-Ag7 molecules. The peptides were isolated using Amicon Centriplus® YM-10 centrifugation devices. The presence of peptides has been confirmed via Matrix-Assisted Laser Desorption/Ionization Mass Spectrometry (MALDI-MS). Analysis of the MHC class II I-Ag7 bound peptides from the two mouse strains will reveal if the expression of I-E quantitatively or qualitatively affects antigen presentation.

Environmental

Poster Session 10:00 AM - 11:00 AM

BOARD 01 STUDIES ON THE LEAF SPOT OF WALNUT INCITED BY *GNOMONIA LEPTOSTYLA* (FR.) CES. & DE NOTE. **DAVID L. MASON, DMASON@WITTENBERG.EDU, DEPT OF BIOLOGY, WITTENBERG UNIVERSITY, SPRINGFIELD OH 45501**

The objective of this study was to investigate the host parasite relations of the leaf spot disease of *Juglans nigra* incited by the fungus, *Gnomonia leptostyla*. Lesions express primarily on the leaflets as small necrotic spots that slowly increase in size. A chlorotic area frequently develops and expands around the margins of a necrotic lesion. Although the infection is not systemic, many of the leaflets can become heavily infected during the mid to latter days of July into October, and they appear to undergo abscission earlier than healthy leaflets. Host parasite relations were evaluated by means of light microscopy, transmission electron microscopy (TEM) and scanning electron microscopy (SEM). The results from inoculation trials revealed that the parasite can enter the host by direct penetration of epithelial cells from a conidium that forms an appressorum-like structure or from a spore germ-tube that grows directly through a stoma. Results from histological studies on invaded tissues revealed a number of findings. In cells directly penetrated, TEM, showed that multinucleated hyphae readily grow from cell to cell. Hyphae were also seen penetrating the host cell wall and extending into the intercellular spaces. The host cells appeared to be rapidly destroyed by intracellular invasion of hyphae. In contrast, with intercellular growth of hyphae, mesothelial cells were not as readily damaged, for TEM shows intact chloroplasts and micothondria in the cytoplasm. Haustoria were frequently seen penetrating cells from the intercellular hyphae. Histological studies also revealed hyphae growing between epithelial cells to establish spore-bearing, subcuticular, acervuli.

BOARD 02 DISCOVERY OF A NEW SEX PHEROMONE IN TICKS. **CHRIS I. SANDERS S04.CSANDERS@WITTENBERG.EDU, JEFF L. DOMINGUS, JAY A. YODER AND PETER E. HANSON, 203 W COLLEGE AVE, WITTENBERG UNIVERSITY, SPRINGFIELD OH 45501**

2,6-Dichlorophenol has so far been the only verified attractant sex pheromone of the American dog tick, *Dermacentor variabilis* (Say),

and acts to bring members of the mating pair together. Females release this pheromone during feeding, which prompts nearby feeding males to become excited, detach and search for the female emitter. Extracts of blood-engorged female adults (100 per replicate; N=3) obtained by Soxhlet extraction were analyzed by GC/MS using single-ion monitoring detection (SIM, m/z = 162 *e.g.* the parent ion of a dichlorophenol). Observed retention times matched those of authentic standards (9.24min for 2,4-DCP; 9.74min for 2,6-DCP) and co-injection of tick extracts with authentic standards produced single, larger peaks. Extracts contained 2,4-dichlorophenol (2,4-DCP) in addition to the expected 2,6-DCP, in a 1:9 ratio. No monochlorophenols (*i.e.*, 2-chlorophenol and 4-chlorophenol; m/z = 128) were detected. Eggs (replicates of ~2,000; N=3), used as a negative control, contained no chlorophenols. When tested in 9cm i.d. Petri dish bioassays 2,4-DCP was highly attractive to partially fed, sexually excited males (60%), and results compared favorably to number of males attracted to 2,6-DCP (65%) (replicates of 10 each; N=10). Monochlorophenols were not attractive. Our conclusion is that 2,4-DCP is also a component of attractant sex pheromone in *D. variabilis*.

Board 03 FIRST REPORT OF A TRICHLOROPHENOL IN TICKS AND ITS PROBABLE FUNCTION.

Jeff L. Domingus s04.jdomingus@wittenberg.edu, **Chris I. Sanders, Peter E. Hanson and Jay A. Yoder, Wittenberg University, Dept of Biology and Chemistry, Springfield OH 45505**

Chlorophenols are found in all developmental stages and are sequestered in glands as the tick completes its life cycle. Only females can secrete these chlorophenols (namely 2,6-DCP). This sex-dependent secretion, coupled with attractiveness of chlorophenols to males indicates that chlorophenols act as sex pheromones. 2,4,6-trichlorophenol (2,4,6-TCP) was detected in adults and nymphs, but not larvae or eggs of the American dog tick, *Dermacentor variabilis* (Say). This report of 2,4,6-TCP supplements our previous observations of chlorophenols in ticks, namely 2,4-dichlorophenol (2,4-DCP) and 2,6-dichlorophenol (2,6-DCP). Identification of 2,4,6-TCP was achieved by obtaining extracts from live, pathogen-free ticks. Analysis of extracts produced using refluxing diethyl ether in a Soxhlet apparatus (100 per replicate; N=3) was conducted by single ion monitoring GC/MS (SIM GCMS, m/z = 198 *e.g.* m/z of a trichlorophenol). Only a single peak was observed. Identification of the compound as 2,4,6-TCP was made by comparison of retention time to that of authentic standard (9.45min) and co-injection. 2,4,6-TCP is behaviorally active, prompting 65% attraction by fed sexually excited males compared to 49% for acetone controls in 9cm i.d. Petri dish bioassays (replicates of 10; N=10; χ^2, $P<0.05$). Synthesis studies with $Na^{36}Cl$ suggest that chlorides on 2,4,6-TCP are derived from host blood. Thus, 2,4,6-TCP production plays an important role in chloride elimination to produce fresh water. Less chemically efficient, albeit more prevalent, is production of 2,4-DCP and 2,6-DCP. We conclude that production of chlorophenols in ticks serves two purposes; to desalinate a salt-rich bloodmeal, and to produce compounds that serve as sex pheromones.

Board 04 THE EFFECT OF REGULATORY PEPTIDES ON REGENERATION AND EPITHELIAL CELL PROLIFERATION IN HYDRA.

Andrea M. Albrigo andrea@albrigo.com, **(L. Epp epplg@muc.edu), Mount Union College, 1972 Clark Ave, Alliance OH 44601**

Peptide signaling molecules have regulatory roles in various developmental processes. The tissue of hydra contains such peptides which have been shown to regulate gene expressions and cell differentiation, induce muscle contraction, and initiate bud release. However, not all the possible effects of these peptides have been demonstrated. Moreover, many have not yet been bioassayed for any developmental effect. This study assays for the possible effects of three such peptides (HYM 194, HYM 330 and HYM 346) on Hydra vulgaris. Bioassay of these peptides includes their effect on regeneration, including tentacle formation, as determined by observation for the initiation of tentacle buds, and the differentiation of basal disks, as determined by specific peroxidase staining of basal disk tissue (n=8/trial). Also being investigated is the possible effect of these peptides on epithelial cell proliferation, as quantified by labeling proliferating hydra cells with BrdU followed by staining with BrdU antibody. Results indicate a decrease in basal disk regeneration time from 28 hours to under 8 hours after HYM 194 treatment.

Board 05 THE EFFECT OF REGULATORY PEPTIDES ON NERVE AND NEMATOCYTE DIFFERENTIATION IN HYDRA.

Dustin M. Wallace wallacdm@muc.edu, **(Leonard Epp epplg@muc.edu), Mount Union College, 1972 Clark Ave, Alliance OH 44601**

Peptides isolated from hydra tissue have been found to be active as signaling molecules, regulating specific developmental events in the animal. These events include regeneration, cell differentiation and gene expression, among others. This study bioassays the possible effects of three of these peptides (HYM 194, HYM 330 and HYM 346) on differentiation of specific cell types, nerve cells and nematocytes, in *Hydra vulgaris* and *Hydra magnipapillata*. To accomplish the bioassay, proliferating interstitial cells are labeled with BrdU by injecting BrdU into the gastrovascular cavity of the animal (n = 10). After appropriate developmental periods, hydra are pooled and macerated. Then, nematocytes and nerve cells, which are the developmental progeny of the pluripotent interstitial cells, are identified and counted after BrdU antibody staining. Altered numbers of these progeny cells in peptide-treated animals as compared to controls would indicate a regulatory effect by these peptides on the rate of differentiation of these cell types. Preliminary results indicate that HYM 194 has no effect on nematocyte differentiation, while HYM 330 may suppress nematocyte differentiation.

Board 06 SELECTION OF PHENOLICS IN ALPINE PLANTS BY *OCHOTONA PRINCEPS* (NORTH AMERICAN PIKAS).

Kelly L. Buck buckkl@muc.edu, **(Brandon Sheafor** sheafobr@muc.edu**), Mount Union College, 1972 College Ave., Alliance OH 44601**

North American pikas (*Ochotona princeps*), small mammals belonging to the Order Lagomorpha, inhabit rocky, talus slopes above the tree line throughout western North America. Pikas collect large quantities of alpine plants during the summer, the majority of which go into a winter stash called a haypile. Haypiles are the only source of food for pikas throughout the winter. Many plants collected are high in phenolics, secondary compounds which are produced by plants probably to discourage herbivory. However, pikas appear to choose plants high in phenolics. Phenolics act as a preservative agent for the haypile by reducing bacterial and fungal growth. Selective pressures placed on plants by herbivores would be expected to produce an increase in phenolic production possibly to repel herbivores. However, it is possible that pikas cause a reduction in secondary compound production by harvesting plants high in phenolics. This study investigates if pikas influence phenolic production in alpine plants. *Acomastylis rossii, Cirsium scopulorum, Pentaphylloides floribunda*, plants commonly found in haypiles, were collected above treeline in Colorado. Plant collections (three at each elevation ~20 grams) were made at low (~2,866 meters), medium (~3,017 meters), and high (~3,470 meters) altitudes, areas inhabited by pikas, and areas that lack pikas. Base, middle, and tip sections of plant leaves will be spectrophotometrically assayed in order to quantify phenolic concentrations. This research may demonstrate if pikas place selective pressures on alpine plant phenolic production, and hopefully will provide insight into the evolutionary relationships between these mammals and these plants.

Board 07 EFFECTS OF THE HERBICIDE ROUNDUPÅ (GLYPHOSATE) ON DEVELOPED HERBICIDE RESISTANCE IN *BRASSICA RAPA*.

Rebecca D. Sears searsr@muc.edu **(Charles McClaugherty** mcclauca@muc.edu**), Mount Union College, 1972 Clark Ave, Alliance OH 44601**

Modern crop production has become increasingly reliant on manufactured chemicals as a means of weed control. One problem with the use of herbicides is the natural development of herbicide resistance in plants. Herbicide resistance refers to the ability of some plants within a population to survive an herbicide treatment that would normally control the population of this plant. When this occurs, higher doses or more potent herbicides, which are harmful to the environment, must be utilized to control weeds. The purpose of this experiment is to determine the ability of Wisconsin Fast Plants™ (*Brassica rapa)* to develop resistance to the herbicide glyphosate, the active ingredient of the popular herbicide Roundup®. *Brassica rapa* is a weed species, commonly known as wild mustard, and is also a close relative of Canola an important crop used to produce cooking oil. An effective, yet sub-lethal dose of Roundup® which limits the survival of plants will be determined by toxicity trials. Treated at this level, plants are on average stunted, have reduced flower count at 14 days and produce fewer seeds. *Brassica rapa* will be grown under 24 hour lighting in the laboratory with a constant water supply. At ten days the plants will be treated by applying Roundup® by paintbrush on two leaves per plant. Following growth, pollination and senescence, seeds will be collected and planted over three to five generations. Mortality rate, seed set, germination rates and seedling survival are indicators that will be used to assess plant fitness. Comparison of these data across generations will determine whether there has been a significant change in the fitness of *Brassica rapa,* indicating whether herbicide resistance has developed in this laboratory population.

Board 08 BIOFILM GROWTH IN POND MESOCOSMS AFTER DISTURBANCE BY CARBARYL AS MEASURED BY THREE-DIMENSIONAL, CONFOCAL IMAGING.

Lindsay A. Nixon lanixon@owu.edu, **(Laura Tuhela-Reuning** lmtuhela@owu.edu**), Ohio Wesleyan University, Delaware OH 43015**

Biofilms are ubiquitous in natural water systems but little is known about the response of the microbes in the biofilms to chemical disturbances. To study the effect of carbaryl, the active chemical in the pesticide Sevin®, on biofilm formation, twenty aquatic mesocosms were filled with water and a subset of the biological community collected in July 2002 from a pond on the Kraus Wilderness Preserve in Delaware,

OH. The mesocosms equilibrated for six weeks, after which four treatments of carbaryl were added to the mesocosms: 0.0 µg/ml, 0.1 µg/ml, 1.0 µg/ml, and 20 µg/ml. Glass microscope slides, on which biofilms could attach, were placed into each mesocosm immediately before adding the carbaryl. One biofilm-covered slide was retrieved from each mesocosm daily for the first five days after the carbaryl disturbance and again on days 8, 9, 11, 22, and 36. To reconstruct the three-dimensional architecture of the biofilms, each biofilm was stained with propidium iodide and imaged in a series of cross-sections (each 1 µm thick) using confocal laser scanning microscopy. Four quadrants, each with an area of 0.48 mm^2, were analyzed on each biofilm. Preliminary results show an increase in the number of bacteria, as measured by total plate counts (TPC), in mesocosms with the highest carbaryl concentrations. On day 15, the TPC of the 20 µg/ml carbaryl treatment was 2.5×10^3 cfu/ml while the TPC in the 0.1 µg/ml treatment was 5.0×10^2 cfu/ml, suggesting higher carbaryl concentrations cause an increase in bacteria in aquatic communities.

Board 09 SETTLEMENT OF MARINE LARVAE ON MICROPATTERNED SURFACES. Alex A. Johnson johnsonaa@hiram.edu, (Greg K. Szulgit, szulgitgk@hiram.edu), Hiram College, Dept of Biology, PO Box 67, Hiram OH 44234

Many marine invertebrate species disperse themselves by taking on larval forms (usually microscopic) that drift or swim through the water column until they encounter a surface that is suitable for their settlement. It is well known that certain surfaces are more attractive to certain larvae, but the factors that regulate the settlement of such larvae are still being discovered. These factors are of great interest to scientists and marine engineers, who often would like to prevent the settling of these creatures on boat hulls, pipe walls, and other surfaces. To test the preferences of larval settling, optically patterned surfaces were suspended in sea grass beds in the Indian River Lagoon, approximately 20m from the shores of The Harbor Branch Oceanographic Institute, Fort Pierce, Florida. These surfaces displayed five conditions (all black; all clear; alternating black and clear parallel lines that were 0.18mm thick and of equivalent spacing; and similar patterns of 0.35mm and 0.70mm thickness and spacing). The parallel patterned conditions were placed next to black and clear conditions in a Latin Square configuration to reduce possible biases due to adjacent combinations. A total of 35 plates were placed in the water for testing. The hypothesis tested was that different surfaces would attract different species of larvae. The expectations were that there would be a correlation between species of larvae and pattern darkness/lightness.

Board 11 PHYLOGENETIC ANALYSIS OF THE HETEROCYSTOUS CYANOBACTERIA BASED ON THE 23S rRNA GENE. Kyle C. Kenyon, kenyonkc@muohio.edu, Linda E. Watson watsonle@muohio.edu, Susan R. Barnum barnumsr@muohio.edu, Dept of Botany, 316 Pearson Hall, Miami University, Oxford OH 45056

Cyanobacterial nomenclature has been traditionally based on morphological and reproductive characteristics. It was proposed that they be separated into five Subsections, with I, II and III comprising the nonheterocystous strains and Subsection IV (12 genera) and V (6 genera), the heterocystous strains. Subsection II and IV more recently were split into two subgroups each based on morphology, with a total of 56 genera across all sections. Another scheme classifies them into 6 orders, with 7 distinct families and 66 genera. The heterocystous cyanobacteria are distinguished by the ability to fix atmospheric nitrogen in specialized cells called heterocysts. A group of 21 strains comprising members of the heterocystous cyanobacteria (Subsection IV and V) and 3 outgroup strains from Subsection I, II and III were used for phylogenetic analysis. DNA was isolated from each strain, the 23S large subunit ribosomal RNA gene was amplified using PCR, cloned into *E. coli* and sequenced using Sanger dideoxy chemistry and an automated sequencer. Final consensus sequences were made from 3 sequenced clones. Stems and loops were weighted for the RNA secondary structure and analyses were made using Paup 4.0. Phylogenetic trees were constructed using parsimony, maximum likelihood and distance methods. Bootstrap analysis, a standard re-sampling method that evaluates clade support, was done. Based on these analyses, the Subsection IV and V heterocystous cyanobacteria form a well supported, monophyletic lineage. The heterocystous strains should be treated as a single group and the classification into two Subsections based on reproductive characteristics is not well supported.

Board 12 QUANTIFYING POPULATION LOSS OF GOLDENSEAL, *HYDRASTIS CANADENSIS* L., IN OHIO. Margaret R Mulligan margiemulligan@hotmail.com, and David L. Gorchov gorchodl@muohio.edu, Miami University, Botany Dept, Pearson Hall, Oxford OH 45056

Goldenseal, *Hydrastis canadensis* L. (Ranunculaceae), is a slow-growing perennial herb that is harvested for the medicinal properties of its rhizome. Goldenseal has become increasingly rare throughout its range, and was listed on the Convention for International Trade on Endangered Species (CITES) in 1997, but it is not clear to what extent this is due to overharvesting versus habitat loss or degradation. In Ohio, the core of its range, there is minimal information on the status of goldenseal, but populations are believed to be declining. Voucher specimens from eight herbaria (MU, OS, CLM, BHO, KE, BGSU, JHWU, CINC) in Ohio were examined to determine what proportion of sites that historically supported goldenseal populations still supports them today. Out of 269 voucher specimens reviewed, 71 (dated 1845 - 1998) had sufficient detail for the collection site to be relocated. Eight of the sites (11%) were deforested and no longer supported populations. The remaining 63-forested sites were searched for goldenseal in summer 2002 and the number of plants (ramets) present recorded for each. Goldenseal was found on 40(63%) of these forested sites. Most (54%) of these populations had less than 200 plants, 19% had 200 to 1000 plants and 27% had more than a 1000 plants. This study indicates that nearly half of documented goldenseal populations have gone extinct, suggesting an overall decline in population numbers of goldenseal in Ohio. Most of the population loss is due to factors other than habitat loss. This suggests that overcollection is an important cause of this decline.

Board 13 SPATIAL AND PREDATION ECOLOGY OF WHELKS IN A SHALLOW EMBAYMENT IN THE RACHEL CARSON RESERVE, BEAUFORT, NORTH CAROLINA. Sara J. O'Donnell s03.sodonnell@wittenberg.edu, and Maggie K. Schneider, (Dr. Dan Rittschof and Dr. Kathy Reinsel), Wittenberg University, PO Box 720, Springfield OH 45501

Movement and predation by 56 individuals of two species of whelks, *Busycon contrarium* (n = 22) and *B. carica* (n = 34), were studied in a 300 by 600 m high salinity embayment surveyed on a 10 m grid. These large predatory snails were hypothesized to feed and move similarly. Snails were individually tagged and their movements tracked from late August until November 2002. Snails were divided into 3 experimental groups. A group of 13 *B. contrarium* and 19 *B. carica* were released where they were found and followed. A second group of 5 *B. contrarium* and 8 *B. carica* were released in a specific microhabitat in the embayment and followed for 3 weeks. This group was then re-released in a new microhabitat and followed for another 3 weeks. Movements of the final group of 4 *B. contrarium* and 7 *B. carica* were followed for 3 weeks and then each snail was surrounded by eight evenly spaced clams, *Merceneria merceneria*, at a distance of 14 cm while buried at known compass points. Movements and predation were quantified. Snails that moved were returned to the original location and clams that were eaten were replaced. Although usually found buried, most snails moved daily and movement was microhabitat dependent. Relatively few movements were related to predation. *B. contrarium* moves more and occupies a larger active space. We reject our hypothesis that *B. contraium* and *B. carica* use habitat similarly.

Board 14 RESPONSE TO LIGHT BY THE HERMIT CRAB *CLIBANARIUS TRICOLOR* AT NORTH POINT, SAN SALVADOR, BAHAMAS. Jessica D. Ebie s04.jebie@wittenberg.edu, Adrianna N. Zito, Valery S. Haley, James M. Welch, Kathleen A. Reinsel, Dept of Biology, Wittenberg University, Springfield OH 45501

The hermit crab *Clibanarius tricolor* inhabits the intertidal zone in tropical areas. We observed that *Clibanarius tricolor* occur in clusters during the day but not during the night. We hypothesized that *C. tricolor* is more active at night than during the day, and the presence of light inhibits the hermit crab's activity. We observed groups of 100 individuals in three light conditions in the lab: 24 h darkness, 24 h light, and a natural cycle. We also examined a field group contained in a 1.8 m^2 quadrat in the lower intertidal zone near the Gerace Research Center in San Salvador, Bahamas. Data were collected every other day for 14 d during both day and night in June 2002. The hermit crabs were most active in the field at night and in darkness in the laboratory. The hermit crabs in the 24 h light treatment were more active during nighttime hours than during day hours, indicating that they maintained a circadian rhythm despite the constant light. In addition, hermit crabs in the laboratory were not as active as those in the field. Therefore, we concluded that light contributes to the regulation of *C. tricolor* activity but is not the sole factor.

Board 15 INDUCTION OF SHELL-SWITCHING BEHAVIOR IN *CLIBANARIUS TRICOLOR* BY CHEMICAL ODORS. Patchouly N. Banks s03.pbanks@wittenberg.edu, Sara J. Hallas, Kristen S. Lindeman, Kathleen A. Reinsel, and James M. Welch, Dept of Biology, Wittenberg University, PO Box 720, Springfield OH 45501

The hermit crab *Clibanarius tricolor* lives in the rocky intertidal zone of tropical regions and inhabits snail shells. Finding an appropriate shell for protection is important to the hermit crab's survival. Odors from dead snails and/or hermit crabs elicit a shell-switching response in other hermit crabs. We hypothesized that snail and crab odor solutions would stimulate shell-switching behavior in *Clibanarius tricolor*. Groups of 10 crabs were placed in a bucket with 1.89L of seawater and allowed to acclimate for 5 seconds before either a control or odor solution was added; after 10 seconds, their behavior was observed for one minute. Responses consisted of moving away from the other

crabs (run), pulling into their shells (hide), or touching other crabs' shells (fondle). In seawater controls (n=240), crabs responded primarily by hiding, while they fondled more in response to the odor solutions. A total of 44% and 42% of the crabs fondled in response to the snail odor solution (n=120) and crab odor solution (n=120), respectively. The crabs' responses to both snail and crab odor solutions support our hypothesis that these odors are chemical cues for shell-switching behavior in *Clibanarius tricolor*.

Board 16 THE EFFECTS OF ACID MINE DRAINAGE ON ECTOPARASITES OF THE CREEK CHUB (*Semotilus atromaculatus*) IN THE SUNDAY CREEK WATERSHED, OHIO. **Christopher D. Horn chorn@muskingum.edu (Shirley Atkinson shirleya@muskingum.edu.), Muskingum College, Biology Dept, 163 Stormont St, New Concord OH 43762**

Acid Mine Drainage (AMD) often occurs when tailings from mines enter surface water systems. The resulting deteriorated conditions stress fish in these streams, increasing susceptibility to parasitism. However, these conditions are also unfavorable to the parasites themselves. Our goal is to determine whether there are correlations between varying degrees of AMD and ectoparasite populations of a common, pollution tolerant fish, *Semotilus atromaculatus*. We hypothesize that as AMD conditions become more severe species richness of ectoparasites will diminish until conditions are no longer suitable for the host. Sampling was conducted at 33 sites in the Sunday Creek watershed (Ohio), an area that has been subject to heavy coal mining. Sites were chosen based on data collected by the Ohio EPA during summer 2001. Whole fish samples were collected by either backpack electrofishing or seining, placed into separate, sealed, marked bags, and placed on ice until they could be frozen. Ambient water data including pH, dissolved oxygen, temperature, oxidation reduction potential, specific conductivity, total alkalinity, dissolved iron, and total hardness were recorded in the field. Stream characteristics, such as flow, structure, and iron hydroxide precipitate were noted. Fish were later examined for presence of any ectoparasites. Ectoparasite abundance and relative abundance were calculated for each individual and averaged for each site. Data will then be analyzed to determine if there are correlations between ambient water data and parasite populations. As of yet no definite trends have been observed.

Board 17 ANALYSIS AND COMPARISON OF RELICT TALLGRASS PRAIRIE OPENINGS AND THEIR ASSOCIATED SPECIES WITHIN THE SOUTHEASTERN OHIO SUNDAY CREEK WATERSHED. **Jason S. Larson jlarson@muskingum.edu, (James L. Dooley jdooley@muskingum.edu), Dept of Biology, Muskingum College, 163 Stormont St, New Concord OH 43762**

This study will examine biodiversity of species within localized tallgrass prairie remnants in southeastern Ohio. The presence/absence of data will determine various diversity functions including alpha-diversity (species richness within sites), beta-diversity (species turnover between sites related to differences in vegetation structure), and gamma-diversity (turnover related to distance between sites, independent of habitat change). The study sites, Buffalo Beats and Utah Ridge Prairie Pass, the latter discovered during the summer of 2001, are located between the headwaters of the Big and Carr Bailey streams, within the Sunday Creek Watershed, Athens County, Ohio. These openings lie within 300 meters of each other, Buffalo Beats a prairie remnant on a hilltop lens of calcareous clay soil surrounded by a southeastern Ohio mixed oak forest and Utah Ridge Prairie Pass located along both edges of SR 685 adjacent to the same forest type that surrounds Buffalo Beats. Variation in alpha-diversity within regions is related to variation in vegetation structure, and plant-density variation is best predicted by a measure of vegetation density. The relationships between species diversity and density and vegetation structure are similar in the two areas. Within areas, it is expected that regression analysis will show that species turnover is significantly related to both vegetation structural differences (beta-diversity) and distance between sites (gamma-diversity). Identification of factors promoting species turnover between sites, beyond distance and vegetation effects, will be identified but may include isolation dynamics relating to vegetation structure and dispersal limitations of the species within the sites.

Board 18 EVOLUTIONARY STASIS IN THE DROSOPHILA SPERMTAIL PROTEIN ²2 TUBULIN. **Justin Caserta casertja@notes.udayton.edu, Sara Kidd, Mark G. Nielsen mark.Nielsen@notes.udayton.edu, Dept of Biology, University of Dayton, Dayton OH 45469-2320**

Axonemes are microtubule-based organelles that mediate motility in cilia and flagella. Structure/function tests show the *D. melanogaster* spermtail axoneme requires a male-specific form of β-tubulin, β2 tubulin, to support their exceptionally long spermtails. β2 sequence identity exerts unusual control over axoneme morphogenesis, in the sense that small alterations in β2 tubulin sequence result in discrete defects in axoneme formation. The sensitivity of the axoneme to ²2 identity raises the question, how did the β2 protein evolve while maintaining a functional axoneme? To answer this question, β2 was cloned (N=1) and sequenced in 7 different species of flies (Diptera, Brachycera) that last shared a common ancestor 80 million years ago. Ninety percent of the β2 coding sequence was obtained from each of these species, and there was no variation among them in the amino acids coded by their β2 sequences. We argue that this unusual evolutionary stasis lies in the exceptionally stringent structure/function relationship between the β2 tubulin protein and the spermtail axoneme.

Board 19 GROUP SIZE IN THE SURGEONFISH *ANCANTHURUS COERULEUS*: FORAGING RATES AND INDIVIDUAL HEALTH. **Eric D. Rosch erosch@wooster.edu (Erika Iyengar eiyengar@wooster.edu) C-2607 College of Wooster, 1189 Beall Ave, Wooster OH 44691**

Surgeonfish, as well as several other tropical marine fish, forage in groups ranging from one to over 500 individuals. Previous studies indicate that larger schools of surgeonfish are more capable of overcoming the territorial defenses of several damselfish species rather than individuals, and so gain greater access to algal beds. However, this foraging advantage comes with a price. Individual fish foraging in large groups are less likely to visit cleaning stations, and therefore their parasite load could be substantially higher than individuals feeding alone or in small groups. This study focused on the behavior of blue tangs, *Acanthurus coeruleus*, a species of surgeonfish, near Andros Island, Bahamas to assess the importance of group size and how it affects an individual's health. Observations were taken during a four-week period from May-June and a two-week period in December 2002 by following focal animals for fifteen minutes at depths ranging from 2-10 meters (N=42). This study examined the tradeoffs between group size (ranging from solitary individuals to groups of over 50 members) and its corresponding effect on feeding rate, aggressive interactions between blue tangs and resident damselfish, and individual health based on frequency of cleaning behaviors. Determining the significance of group size to trade-offs between feeding efficiency and risk of disease will enhance scientific understanding of the life strategies of marine fishes.

Board 20 MULTICOLORED ASIAN LADY BEETLES AND THEIR HOST PREFERENCES. **Roger N. Williams Williams.14@osu.edu Sandra Garcés, Mark Headings*, Kevin B. McClure, Dept of Entomology, OARDC, The Ohio State University, Wooster OH 44691, *Agricultural Technical Institute**

Multicolored Asian lady beetles (MALB), *Harmonia axyridis* (Pallas) were introduced as biocontrol agents to control the pecan aphid, pear psylla and other soft-bodied insects. The feeding habits of the MALB are not well understood as they are primarily arboreal and prefer to feed in the upper canopy. In 2001, the soybean aphid was quite abundant and the lady beetle population exploded. The 2002 growing season was a lean year for collection of the MALB in Ohio. The drought and paucity of soybean aphids in the Midwest have been blamed for reduced MALB activity in 2002. Even though catches of beetles were limited, hundreds of adults were observed in alfalfa fields, vineyards, mung beans and weed patches. In most instances the MALB shared the stage with several other species of lady beetles. However, MALB were the only lady beetles found in vineyards feeding on grape phylloxera. From mid-summer and into early fall they were present on mung beans. After several cool nights and a frost, we found only MALB on elm trees on warmer days through late October. Both hybrid elm trees and Chinese elm trees were examined at several locations in Ohio. Chinese elms (3-15 per tree) were preferred over hybrid elms (0-5 per tree) as Chinese elms were the preferred host for an aphid fed on by MALB. Chinese elms harbor one of the few sources of food left available to the MALB in late season before they move to protected places to aggregate. We collected a total of 796 beetles over the season on grapes, alfalfa, mung beans and from weeds. They were assumed to be feeding on aphid and other soft bodied species found on these host plants.

Board 21 DOWNSTREAM DRIFT AND UPSTREAM MIGRATION OF ENDEMIC HAWAIIAN LARVAL AMPHIDROMOUS SHRIMP (*ATYOIDA BISULCATA*). **Michael R. Kulik[1] kulikmir@notes.udayton.edu, Kathleen R. Jennings[1] jenninkr@notes.udayton.edu, M. Eric Benbow 2 benbow@msu.edu, Mollie D. McIntosh[2] mcinto57@msu.edu, Albert J. Burky[1] burky@udayton.edu, [1]Dept of Biology, University of Dayton, Dayton OH 45469-2320, [2]Dept of Entomology, Michigan State University**

The streams of Hawaii have been historically dewatered for anthropogenic use, which interrupts the life cycle of several amphidromous stream species. The amphidromous life cycle involves adult reproduction in streams where eggs hatch and larvae are swept to the ocean for a period of obligatory growth and development. Postlarvae migrate back into the streams for growth until reproductive stage. In this study, we monitored the downstream drift and upstream migration of larval *Atyoida bisulcata* in Kahakuloa Stream, Maui, Hawaii, from April through August in 2000. We quantified diurnal larval drift using standard drift nets (4 net samples per day for 7 days) and

postlarval migration using modified Breder traps (>24 trap samples per day for 7 days). Both drift and migration occurred throughout the summer, with peaks in late April and early July, and appears to be influenced by moonlight and lunar cycles. Drift and migration were correlated and both were nearly zero in mid-May, mid-June and mid-August. Drift fell in late July, while migration was greatest on the same sampling date. We also found a distinct diurnal drift pattern for shrimp zoea with peak drift occurring near midnight; however, migration was too low to determine any diurnal patterns. Lunar and diurnal patterns provide increased probability of oceanic development and reduced mortality in both drift and upstream migration.

BOARD 22 THE MITOCHONDRIAL CYTOCHROME C PEROXIDASE SYSTEM OF ADULT *HYMENOLEPIS DIMINUTA* (CESTODA). **JAHMAL B. GREEN** JBGREEN@BGNET.BGSU.EDU **AND CARMEN F. FIORAVANT** CFIORAV@BGNET.BGSU.EDU, **DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403**

The adult cestode, *Hymenolepis diminuta*, an intestinal parasite of the rat, has a predominantly anaerobic energy metabolism and forms succinate as the major end product of glucose utilization. Succinate formation is a mitochondrial function that is catalyzed by the electron transport-coupled fumarate reductase and results in a Site I-dependent, net ATP generation. Although *H. diminuta* resides in the rat small intestine and does not energetically require oxygen, it assimilates oxygen, when available, and forms H_2O_2 via a less active mitochondrial NADH oxidase system. Thus, with episodic oxygen exposure, the cestode would produce a highly reactive molecular species. But, adult *H. diminuta* has no detectable catalase activity. Resolution of this dilemma is apparent in the finding of a mitochondrial soluble reduced cytochrome c peroxidase (CCP) in *H. diminuta*. Employing the mitochondrial soluble fraction as the enzyme source, adult *H. diminuta* CCP was initially characterized and partially purified. Based on thermal lability studies, CCP was differentiated from cytochrome c oxidase activity and oxidized or reduced cytochrome c maintained CCP activity that was optimal at pH 7.0. The apparent Km for reduced cytochrome c and H_2O_2 were 0.034± SE 0.004 and 0.067± 0.008 [n=3] mM, respectively while the apparent Vmax was 2.67± 0.67 and 2.25±.0.25 [n=3] moles/min/mg protein. Initial purification studies indicated that the cestode CCP has a monomeric Mr of 32-38 kDa. Further study of this helminth enzyme is being pursued because CCP is absent in mammalian systems and specific disruption of the helminth enzyme could be used to chemotherapeutic advantage. Supported in part by NIH AI-15597 (C.F.).

BOARD 23 TRANSPIRATION IN A RED PINE STAND BASED ON SAP FLOW MEASUREMENTS. **NATHAN L. REID** REID_N@DENISON.EDU, **(FARDAD FIROOZNIA** FIROOZNIA@DENISON.EDU**), SLAYTER BOX 2056, DENISON UNIVERSITY, GRANVILLE OH 43023**

The objective of this research is to scale sap flow measurements from individual red pine trees (*Pinus resinosa* Ait.) to an entire red pine stand. Sap flow in tree trunks can be estimated using temperature dissipation probes (TDP). Thirty-mm-long probes were inserted at the four cardinal azimuths (N, S, E, and W) in each tree (N = 33). Similarly, 50-mm-long probes were inserted at the SW, SE, NW, and NE azimuths. Temperature differentials were measured every 10 seconds and means were recorded every 30 minutes using a Campbell 10X datalogger. Sapwood width was measured using 4 stem cores per tree. Sap flow was measured in three trees for the whole summer of 2002, while we other probes were moved among different trees every 10 days. The variation in sap flow was analyzed within and among trees on 10-day intervals to optimize the use of TDP probes in the stand. The sap flow variability measured at different azimuth locations was not consistent between trees. The variability within a tree ranged from 1-100%. Despite such variability, there was good correlation (R^2 values range from 75 to 95%) between daily sap flow of the three constant trees to those of the others. Therefore, we think we can estimate sap flow in any tree using these correlations and thus scale to the level of the stand.

BOARD 24 INFLUENCES ON SIZE AT MATURITY ON *DRABA VERNA* L. (BRASSICACEAE), IN GRANVILLE, OH. **AMY M. ZIDRON** ZIDRON_A@DENISON.EDU **(PAUL ANDREADIS** ANDREADISP@DENISON.EDU **AND JULIANA MULROY** MULROY@DENISONL.EDU**), DENISON UNIVERSITY, GRANVILLE OH 43023**

This research will determine the influence of non-genetic, non-competitive effects on size and fecundity of the plant *Draba verna* L. Previous research on *Draba verna* L. in Granville, OH has shown them to be genetically uniform. Despite this genetic homogeneity, there is considerable variation in the sizes of individual adult plants. This research will explore whether such variations in plant size are transmitted by non-genetic means. Time of emergence, fecundity, survival rate and size of offspring of different sized mothers are being studied under conditions of no competition. The hypothesis is that a large mother will have offspring that are larger, have an earlier time of emergence and have a higher survival rate than the offspring from smaller mothers. Forty mother plants were collected in the spring of 2002 and their seeds were planted in two different media: organic soil in five sheep troughs and finely sieved native Granville soil in twelve window boxes. Different soils were used to see if high nutrition would increase the size of the offspring. Approximately three hundred seeds were planted in the early fall of 2002. The troughs and window boxes were located outside and are checked every other day in order to note time of emergence.

BOARD 25 A COMPARISON OF THE DIVERSITY OF GROUND-DWELLING SPIDERS IN AN OLD-GROWTH BEECH-MAPLE AND A SECOND-GROWTH FOREST. **MAGGIE HODGE** HODGEMA@HIRAM.EDU **AND MELISSA VARRECCHIA, DEPT OF BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234**

Beech-maple forests were once widespread throughout Ohio and Indiana, but uncut, old growth stands are now restricted to a few small remnant sites. We report on preliminary findings of a study designed to measure and compare the diversity of leaf litter spiders in a pristine 200-acre beech-maple forest (100+ years old) and an adjacent, contiguous second growth forest (<30 years old) at the J.H. Barrow Field Station in northeast Ohio. Eight pairs of pitfall traps were sampled in each habitat at weekly intervals from July-September 2001-2002. We compared the familial and generic diversity of the two habitats. The major difference in familial composition was that the Anyphaenidae occurred in the beech maple, but not in the second growth forest, while the opposite was true for the Corinnidae. Lycosidae and Clubionidae were both twice as common in the beech maple samples as compared to the second growth samples. Of those families that occurred in both habitats, most genera found occurred in samples from both habitats, though there were differences in abundance. *Wadotes* (Amaurobiidae) was more than twice as abundant in the second growth samples, whereas *Phrurotimpus* (Liocranidae) and *Pirata* (Lycosidae) were more abundant in the beech maple.

BOARD 27 THE STRUCTURE OF TARANTULA DEFENSIVE DISPLAYS AND ITS RELATION TO ALTERNATIVE DEFENSIVE STRATEGIES. **MICHELLE HAWK** HAWKME@HIRAM.EDU**, RICHARD BLATCHFORD** PARTICLE@ROCKETMAIL.COM**, (SAMUEL D. MARSHALL** MARSHALLSD@HIRAM.EDU**), J.H. BARROW FIELD STATION, DEPT. BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234**

Structure of the defensive display of eight theraphosid genera exposed to two levels of aversive stimuli in the laboratory were examined. The genera were selected to represent divergent clades in the *Theraphosidae*. The genera tested were *Aphonopelma* (Theraphsoinae), *Avicularia* (Aviculariinae), *Pterinochilius* (Harpactirinae), *Heterothele* (Old World Ischonocolinae), *Holothele* (New World Ischonocolinae), *Hysterocrates* (Eumonophorinae), *Selencosmia* (Selenocosminnae), and *Cyriopagopus* (Ornithoctoninae). Some 75 spiders were either subjected to a repetitive puff of air (puff test) or prodded with a blunt probe (prod test). All behaviors were videotaped for later analysis. Eight distinct behaviors were observed and described. The topology of the ethograms for the prod test was more complex than for the puff test for all taxa. We analyzed the frequency of the expression of the eight behaviors observed for all individual specimens in the prod test using a hierarchical cluster analysis. Examination of the dendogram showed two major clusters. One of these contained 24 of the 25 urticating-hair specimens (in the genera *Aphonoplema* and *Avicularia*) in addition to 17 of those from genera that lacked urticating hairs. The clustering pattern was probably explained by the lack of escalation of the defensive display to a more aggressive defense by *Aphonopelma* and *Avicularia*. The experiment will be repeated with 20 specimens of a closely related group to the *Theraphosidae*, the *Barychelidae*, and examine their defense strategies in order to make an outgroup comparison of the evolution of defense displays in tarantulas.

BOARD 28 THE ROLE OF THE WEB IN PREY CAPTURE BY THREE SPECIES OF WEB-BUILDING WOLF SPIDERS (ARANEAE: LYCOSIDAE). **VANESSA GORLEY** GORLEYVA@HIRAM.EDU**, MAGGIE HODGE AND ZACHARY MORRISON, DEPT OF BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234**

Sosippus is the only genus of wolf spiders (Lycosidae) in North America that construct prey-capture webs; other genera are cursorial hunters. The function of a spider web is to enhance the ability of the spider to capture and subdue prey, so we hypothesized that *Sosippus* would capture prey more quickly with a web than without a web. *Sosippus californicus, S. floridanus,* and *S. placidus* were presented with live crickets in two conditions: with or without a web. The time (latency) to subdue the prey was recorded for each condition. We found that *S. placidus* and *S. californicus* captured prey quicker with webs than without webs (Paired, 1-tailed t-tests, *S. placidus:* d.f. = 50, t = -2.032, p <0.05; *S. californicus:* d.f. = 13, t = 3.408, p < 0.05). There was no difference in latency to prey capture with or without a web by *S. floridanus* (d.f. = 40, t = 0.848, p = 0.2008). We postulate that since *S. placidus* and *S. californicus* live in xeric habitats, they may have come to rely on the web to a greater extent than does *S. floridanus*, which lives in more mesic habitats. This may explain why

these two species don't capture prey without webs as quickly as do *S. floridanus* (mean (± s.e.) time (minutes, seconds) to capture without webs: *S. placidus*: 4.34 ± 1.38; *S. californicus*: 8.25 ±1.26; *S. floridanus*: 0.47 ± 0.31).

BOARD 29 CONSTRUCTION, CHARACTERIZATION, AND COLONIZATION OF VIBRIO FISCHERI AMINO ACID AUXOTROPHS. AMBER G. POLLACK POLLACKAG@HIRAM.EDU AND CHERYL WHISTLER[1]; (PRUDENCE HALL HALLPJ@HIRAM.EDU) HIRAM COLLEGE, HIRAM OH 44234, [1]KEWALO MARINE LABORATORY

Vibrio fischeri is a symbiotic bacterium associated with the Hawaiian bobtail squid, *Euprymna scolopes*. It has been shown, through the work of Joerg Graf on amino-acid auxotrophs of *V. fischeri* strain ESR1, that the host squid provides certain amino acids to support the bacteria, and auxotrophy for amino acids in the bacteria can lower the level of its colonization of the squid light organ. We created similar auxotrophs in a different strain background and hope to explain any differences. The original ESR1 auxotrophs were created by transposon mutagenesis and assigned inferred genotypes based on their ability to grow on certain metabolic intermediates. The construction scheme for the ES114 auxotrophs involved a genomic approach—targeting specific genes in the biosynthetic pathways for lysine, cysteine, serine, methionine, and threonine and amplifying with PCR. The resulting fragments were sub-cloned into *V. fischeri* vector pEVS179 to undergo transposon mutagenesis and ultimately antibiotic marker exchange, placing mutants back into the ES114 chromosome. The resulting putative auxotrophs will be characterized, sequenced, and confirmed by Southern blotting. Colonization assays were performed with two lysine mutants and one methionine mutant, and initial assays showed lower than wild-type levels of colonization of the squid light organ. One lysine mutant was characterized as an auxotroph on selective media, and the transposon-inserted gene fragment confirmed as incorporated into the chromosome by a Southern blot (N=1).

BOARD 30 AUTUMNAL PHENOLOGY IN A BEECH-MAPLE FOREST AT HIRAM COLLEGE FIELD STATION. THOMAS C. LOBUR LOBURTC@HIRAM.EDU, (PRUDENCE J. HALL HALLPJ@HIRAM.EDU, MATTHEW H. HILS HILSMH@HIRAM.EDU) DEPT OF BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234

The timing of some seasonal biological phenomena has changed over several decades. Research suggests a connection between recorded phenological events and worldwide climate changes, most especially global warming. A study of autumnal events was initiated in the beech-maple forest at the Hiram College J.H. Barrow Field Station in 2002. The two goals of this study were 1) to initiate a long-term database of seasonal events observed at this location beginning in 2002, and 2) to involve beginning undergraduate students in a field-based research project. Data will be collected annually with the assistance of students enrolled in an introductory level plant biology course. In 2002 student teams have monitored foliage and vegetation changes in assigned forest plots since early September. The data will be entered in an Access database that incorporates data fields for dates of observations, locations of observations, specific species observed, and codes representing the vegetative state of plants observed.

BOARD 31 CORRELATION BETWEEN CHLOROPHYLL AND MINERAL CONTENTS OF SENESCENT AND GREEN LEAVES OF MAPLE TREES (*ACER NIGRUM*). SHEEDEH DANESH AND BRIAN D MITCH, (MORTEZA JAVADI MJAVADI@CSCC.EDU), COLUMBUS STATE COMMUNITY COLLEGE, BIOLOGICAL AND PHYSICAL SCIENCES DEPT, 550 E SPRING ST, COLUMBUS OH 4321.

Leaf chlorophyll and essential element concentrations diminish in autumn. It is hypothesized that senescent leaves contain reduced levels of essential elements, including iron, magnesium and copper, thus the chlorophyll content diminishes accordingly, compared with that of the green leaves. Capstone students at Columbus State Community College conducted an experiment in order to establish a correlation between chlorophyll concentration and essential element contents of both senescent and green leaves of maple trees. The experiment contained three replication, and two treatments per replication, green leaves versus senescent leaves (N=6). Chlorophyll was extracted by Hiscox and Israelstam (1979) method, and chlorophyll concentration was determined based on the work of Arnon (1949). No significant difference was observed between chlorophyll concentration of the green and the senescent leaves. Leaf elemental analysis is in progress.

BOARD 32 VISUAL MAPPING OF THE GPS LOCI OF ARABIDOPSIS. AMY HOVART DAISY711@YAHOO.COM, MATT SHIPP, AND (SARAH WYATT WYATTS@OHIOU.EDU), DEPT OF ENVIRONMENTAL AND PLANT BIOLOGY OHIO UNIVERSITY, ATHENS OH 45701

The gravity persistent signal (gps) mutants of *Arabidopsis* have altered response to gravistimulation at 4°C when returned to room temperature. The gps1 shows no response, the gps2 bends the opposite direction as compared to WT (positively gravitropic), and the gps 3 over responds bending to an angle greater than that of WT. We are using a visual mapping strategy to begin to map the gps loci. To do this we are crossing each gps mutant with the W100 mutant of *Arabidopsis*. The W100 mutant has nine mutations, all easily scored visually, each located at various loci across the five chromosomes of *Arabidopsis thaliana*. The W100 will serve as the female and the gps mutant will serve as the males for cross-fertilization. The F1 generation seeds will be collected, grown to maturity, and allowed to self- fertilize. The F2 generation seeds (the mapping population) will be collected and sown. Each plant will be scored for the gps response and for each of the nine traits. Each mapping trait will be analyzed separately for its segregation with the gps response. Chi-squared tests will be performed to determine if the observed number of plants with a particular phenotype equals the expected for independent assortment indicating whether or not the gps loci is linked to that particular trait. This should allow us to determine on which chromosome the gps loci reside. Partially supported by the Program to Aid in Career Exploration at Ohio University and United States Dept of Agriculture.

Social Science, Environmental, Field Biology
Poster Session 02:00 PM - 03:00 PM

BOARD 01 THE DIFFERENTIAL GEOGRAPHIC DISTRIBUTION OF GROUPS OF OLDER INDIVIDUALS IN LUCAS COUNTY, OHIO. STEPHEN S. CHANG SCHANG@BGNET.BGSU.EDU AND BRUCE W. SMITH BSMITH4@BGNET.BGSU.EDU, DEPT OF GEOGRAPHY, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403

The number of Americans over the age of 60 has been growing in recent years and the variation in their living conditions and needs has increased. One aspect of that variation is the geographic distributions of subgroups of elderly, which is analyzed in Lucas County, Ohio, including Toledo. Data for census block groups with persons aged 60 to 74, 75 to 84, and 85 and older were obtained from the 2000 Census. The distribution of each age group was mapped and compared with the other groups. The greatest dissimilarity occurred when comparing the 60 to 74 group with the over 84 group. The partial correlation coefficient between the geographic distributions of these two groups, using total population as a control variable, was only 0.268, whereas the other coefficients were 0.660 and 0.747. A map analysis of the difference in the spatial distributions of the youngest and oldest age groups of the elderly population showed that the greatest disparities were in census block groups situated on the periphery of Toledo and in the rural area, which have only 307, or 4%, of the total aged 85 and older. Persons aged 60 to 74 are in these locations probably because they moved there during their middle age and are, subsequently, aging-in-place. Delivering services to older persons residing in peripheral locations may become a new challenge for social service agencies, since elderly in the past have generally been concentrated in the city.

BOARD 02 COLEOPTERA AT THE RAVENNA TRAINING AND LOGISTICS SITE, NORTHEAST OHIO, 2001. ROGER WILLIAMS WILLIAMS.14@OSU.EDU AND DIANE HARTZLER, DEPT OF ENTOMOLOGY, OARDC, OHIO STATE UNIVERSITY, WOOSTER OH 44691

Coleoptera were collected at the Ravenna Training and Logistics Site in Northeast Ohio in 2001. This is the third consecutive year that this area has been sampled by using homemade terrestrial traps, aquatic nets, beating sheets, sweep nets, and hand collecting. Weekly monitoring was begun in second week of April and continued through the first week in November. A total of 2,676 specimens were collected in 2001 representing 263 species in 40 families. This is the first assessment of beetles in this confined area since Tertulani's (1998) collection of aquatic macroinvertebrates. Beetle families not previously collected at the Training and Logistics Site in our surveys are Derodontidae, Hydraenidae, Orthoperidae, Ostomatidae, Tetreatomidae, Sphindidae, and Zopheridae. A new state record, a dytiscid beetle is *Neoporus sulcipennis* (Fall). Uncommon beetles collected were Derodontidae-*Derodontus esotericus* Lawrence (1), Dytiscidae-*Acilius sylvanus* Hilsenhoff (2), Gyrinidae-*Gyrinus maculiventris* LeConte-Oygur (1), Hydrophilidae-*Anacaena suturalis* (LeConte) (1), Noteridae-/*Suphisellus puncticollis* Crotch (10), Scolytidae-*Hylastes opacus* Erichson (1), *Xyleborus obesus* LeConte (1), *X. sayi* (Hopkins) (35). Beetles that are considered rare by their respective specialists found at RTLS are Haliplidae-*Haliplus leopardus* Roberts (11), *Haliplus longulus* LeConte (2), and Hydrophilidae-*Enochrus collinus* Brown (1). No threatened or endangered species were encountered in our collections.

BOARD 03 DISPERSION OF GREAT BLUE HERONS ALONG SHORELINES OF UPPER POOL 20,

MISSISSIPPI RIVER. Robert L. Connour II[1] rconnour@owens.edu, Thomas C. Dunstan[2], and Ryan D. Stouder[3]. [1]Dept. Of Math, Life, and Natural Sciences, Owens Community College, Findlay OH 45840, [2]Dept. of Biological Sciences, Western Illinois University, [3]Iowa Dept of Natural Resources

Great Blue Herons (*Ardea herodias*) are common residents along the Mississippi River. Hypothesizing that dispersion was not random, locations of herons from the Mud Island rookery in upper Pool 20 near Keokuk, IA, was studied using surveys conducted from watercraft from May 29 through September 31, 1997. Locations of herons along the shoreline from river mile 360 to 364.5 were plotted three times each day, three days a week. Utilizing Morisita's dispersion index, herons were found to be non-uniformly dispersed throughout this shoreline habitat, with preferences for certain areas. Changes in these preferences corresponded with fluctuations in river stage. As the river lowered late in the season, more rocky ground became exposed near the dam, and heron use of this area increased significantly as shown by statistical t-test. Rapid changes in shoreline use also occurred following fledging, with the area near the rookery receiving increased usage by herons. Territoriality, well documented for this species, was observed. However herons were frequently recorded near each other, although always maintaining some space. Areas exhibiting the highest numbers of shoreline sightings are owned by the State of Illinois and the Illinois Nature Conservancy, and are thus protected from trespass. Further study of both biotic and abiotic factors influencing this dispersion is needed, but results are significantly linked to available foraging habitat and human activity.

Board 04 SPATIAL DISTRIBUTION OF ASTHMA PATIENTS IN OHIO. Yu Zhou yzhou@bgnet.bgsu.edu and Bruce Smith bsmith4@bgnet.bgsu.edu, Dept of Geography, Bowling Green State University, Bowling Green OH 43403

In 2000, there were about 141,000 hospital admissions related to asthma attacks in Ohio. The focus of this work is to determine if there is a relationship between asthma cases and their geographic locations. By mapping the distribution of the asthma patients, based on zip codes, it is clear that the prevalence of asthma is spatially related. High frequencies of asthma attack generally occur in (1) the northeast-southwest Appalachian Mountains area, and (2) the inner urban area. The high frequency in the Appalachian area is related to the physical conditions. The inner urban high frequency, however, may be related to social-economic conditions and air pollution.

Board 05 THE EFFECTS OF WEATHER ON THE CHRISTMAS BIRD COUNT. Linda J. Crabtree ljcrabtree2002@yahoo.com, Dr. Stephen Harvey sjharvey@falcon1.net and Dr. Robert Deal bdeal@shawnee.edu. PO Box 1030, Lucasville, OH 45648-1030

Since 1900 the Audubon Christmas Bird Count has been conducted throughout the United States and Canada each year on a specific date between December 14 and January 5. From 1995 to 2001 the same sub-unit of the count area in Scioto County, Ohio, was surveyed by the authors. The authors expected some correlation between weather factors and the number of species of birds observed, the number of individuals counted and the specific species present on the count day. The average number of species seen in each count year was 32, with a standard deviation of 2.54, while the total individuals seen in each count year was 517, with a standard deviation of 98.96. The four species with the greatest abundance were the European Starling (Sturnus vulgaris), Dark-eyed Junco (Junco hyemalis), Northern Cardinal (Cardinalis cardinalis and Mourning Dove (Zenaida macroura). Each species accounted for less than 11 per cent of the individuals counted over the seven years of study. Collectively these four account for only 33 per cent of total number seen in all years. The data for all species across the years 1995 to 2001 were plotted as a relevé. The species and years were manipulated within the relevé to elicit any discernable pattern. No major patterns were identified and only some minor patterns identified. Mean temperature, wind speed and solar radiation on the count days were then compared to the species data using a Pearson Correlation. No significant correlations were identified. The lack of correlations demonstrates that the Christmas Bird Count is little affected by the weather occurring on any particular count day in Scioto County. While this study involves only a modest area of the county, it does have a diversity of habitats representing most of the habitats of the county, the results of this study may apply to other count areas as well. Confirmation could be obtained by using the same analysis for different count areas. If this holds true, this lends even greater credence to all Christmas Bird Counts across the country.

Board 06 A TEACHING MODEL USING SEASONAL STUDIES OF TWO ANGIOSPERMS: PODOPHYLLUM PELTATUM AND ARISAEMA TRIPHYLLUM. John L. Frola JLFrola@uakron.edu, David J. Stroup, University of Akron, Dept of Biology, Akron OH 44325

Seasonal studies of two plant species, *Podophyllum peltatum* and *Arisaema triphyllum* were carried out. Observations of the shoot apices are described based on an analysis of the theories on shoot apical organization. Mean measurements and descriptions of apical dome height and width were obtained for each species to serve as a basis for classroom discussions concerning the changes in apical organization over a one year period. The mean height of the apical dome of *Podophyllum peltatum* is 40.50 µm and the mean width of the apical dome is 189.16 µm. The mean height of the apical dome of *Arisaema triphyllum* is 28.45 µm and the mean width of the apical dome is 125.05 µm. Results of these studies were used to prepare a multi-media presentation which allowed students to make observations and generate hypotheses about shoot development. During classroom discussion, fundamental anatomical and morphological questions were generated to be used as the basis for student laboratory projects. Science teaching, in particular, is devoting more attention to the need for teaching methods and strategies which can develop students' ability to think logically, analyze, and utilize basic concepts to draw conclusions and make predictions. A model using angiosperm seasonal studies was developed. This model maintains a balance between teaching information content and enhancing higher order thinking skills.

Board 07 SIMILITUDE IN LANDFILL RESEARCH: SIZING OF REFUSE FOR LABORATORY STUDIES. Kerry L. Hughes hughes.416@osu.edu, Timothy J. Murphy murphy.464@osu.edu, Ann D. Christy christy.14@osu.edu, Dept of Food, Agricultural and Biological Engineering, 590 Woody Hayes Drive, Ohio State University, Columbus OH 43210

Preferential flow in landfills affects the success of *in situ* biological treatment of the refuse because microorganisms are transported by the flow of leachate, and degradation can occur only when the moisture content of the refuse exceeds 40% ($^{m}/_{m}$). During laboratory-scale studies of waste, refuse has usually been shredded to a uniform size before use. This has the effect of homogenizing the spatial distribution of the waste within the laboratory reactor and reducing the potential for preferential flow through the refuse. To create laboratory bioreactors that more closely represent full-scale landfills, it may be necessary to scale the size of all refuse components. The goal of this ongoing research is to develop a shredding protocol to create standardized refuse for laboratory studies that accurately and precisely represent the size distribution of refuse emplaced in landfills and that can maintain the spatial heterogeneity of the landfill system in small-scale experiments. In this study, a LMS 200 Laser Sensor, mounted on an overhead rail, was calibrated using objects of a known size. The volumes measured by the laser could be correlated to the known volumes (R^2=0.94, n=18) of the objects. This apparatus was then used to determine the volume of irregularly shaped items (volumes ranging from 11 cm^3 to 3780 cm^3), representative of those found in refuse. Potential limitations of this method of volume determination include interference due to shading and the non-detection of items less than 10mm high. The results from this study illustrate the potential use of this technology to determine the volume distribution of items typically found in refuse. This information will enable refuse for use in laboratory reactors to be scaled to more accurately reflect the spatial heterogeneity of the landfill.

Board 08 EFFECTS OF FOREST COVER ON WHITE-TAILED DEER (ODOCOILEUS VIRGINIANUS) MIGRATION IN NORTHERN WISCONSIN. Jennifer C. Biehl s04.jbiehl@wittenberg.edu, (Timothy Lewis tlewis@wittenberg.edu) Wittenberg University, Biology Dept, 315 Bill Edwards Dr, Springfield OH 45501

Biologists intensively manage white-tailed deer (*Odocoileus virginianus*) populations because of hunting, collisions with vehicles, and impacts on forest cover and surrounding vegetation. As herbivores, white-tailed deer eat a variety of plants and can adversely affect sensitive plant populations. Northern white-tailed deer migrate to winter cover between November and December each year and congregate in deeryards. Deeryards are areas of conifer forest that intercept snow, leaving less snow on the ground, providing thermal cover, and allowing for more deer mobility. The deer migration patterns appear consistent every year. We analyzed how past forest cover and past white-tailed deer migration routes affect current white-tailed deer migration to determine why deer use the same winter yards each year. We used radio telemetry to track 270 white-tailed deer in 30 townships of Ashland, Bayfield, Sawyer, and Price counties in Northern Wisconsin from 1985 to 1994. With these data, we used Arc Map GIS to analyze locations in relation to conifer swamps identified by USFS cover maps in the area from the 1930s and 1950s. The section of Wisconsin that we studied has an area of 275,750 ha^2, with 14% of the total area being conifer swamp in the 1930s and 6% conifer swamp in the 1950s. Our data show that both quantity and distribution of past conifer cover has little correlation with where the deer currently yard. Knowing why white-tailed deer migrate to certain swamps gives insight on how they concentrate and should affect area management plans by informing forest service personnel where to conduct logging and where to protect deer winter habitat.

BOARD 09 UTILIZATION OF COMMUNITY-BASED SERVICES IN 1999 BY OLDER INDIVIDUALS IN ERIE COUNTY, OHIO. **BRUCE W. SMITH BSMITH4@BGNET.BGSU.EDU AND YU ZHOU YZHOU@BGNET.BGSU.EDU, DEPT OF GEOGRAPHY, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403**

Maintaining one's independence as one grows older is a concern for individuals and their families. Thus, delivering services to assist older individuals in maintaining their independence and generally enhancing their quality of life is an important issue. The utilization of sixteen community-based services by the elderly in Erie County, Ohio is analyzed. The data are from a 1999 needs assessment. The respondents did not heavily utilize services, with only 53.7% of the respondents using at least one of the sixteen services included in the survey. Only 23.4% of the respondents used three or more services. Home maintenance services and social activities were more commonly used than legal, financial, transportation, and nutrition services. Comparatively low utilization rates are likely the result of the respondents being in fairly good health, relatively young, and most having adequate incomes. Stepwise logistic regression analysis identified two variables as being significantly related to service utilization: age and income. Persons aged over 75 having incomes below the poverty level had the greatest probability of service use (0.875). In contrast, persons aged 60 to 74 with incomes above the poverty level had the lowest probability of use (0.459). These results are consistent with findings reported from other areas of the country.

BOARD 10 THE EFFECT OF PESTICIDES ON EARTHWORMS AND SOIL MICROBES. **RACHAEL S. WATSON WATSONRS@MUC.EDU, (DR. LIN WU WULI@MUC.EDU), MOUNT UNION COLLEGE, 1972 CLARK AVE, ALLIANCE OH 44601**

This study will determine the toxic effect of two different types of organo-phosphate pesticides on earthworms and common soil microbes. Earthworms, species *Lumbricus terrestris,* will be used because earthworms are the most representative soil animals used for assessing chemical pollution in soils. Microbes are an important part of nutrient recycling in the soil. A preliminary test with a wide range of pesticide concentrations will be conducted on both bacteria and earthworms to determine the concentration range of the insecticides that will be used in the final toxicity tests. Ten worms will be sustained per worm bedding of varying concentrations of the pesticides Diazinon and Malathon and their weight will be measured every 3-4 days to see if the addition of the pesticide into their environment causes changes in this parameter. In addition, their rate of mortality will be recorded in order to calculate LD_{50}. In order to test the effects of insecticides on soil microbes, a sample of soil will be taken from a land preserve with very low or no pesticide and chemical use. This microbe-containing soil will be grown on autoclaved T-Soy nutrient agar containing different concentrations of the Malathon and Diazinon pesticides. Different colonies will be isolated and identified and observations will be made to determine how the colonies were affected by the pesticides.

BOARD 11 PHOTOSYNTHETIC LIGHT USE EFFICIENCY IN RESPONSE TO NITRATE AVAILABILITY IN *ZEA MAYS*. **MATTHEW D. PAINTING PAINTIMD@MUC.EDU, CHARLES MCCLAUGHERTY MCCLAUCA@MUC.EDU, MOUNT UNION COLLEGE, 1972 CLARK AVE, ALLIANCE OH 44601**

Sweet corn (*Zea mays*) is a crop that is fertilized routinely with nitrate. This study compares the photosynthetic light use efficiency in response to nitrate availability in three groups of sweet corn: high nitrate, medium nitrate, and low nitrate. A complete nutrient solution was used for the medium nitrate group and was varied for the high and low groups. Fifty milliliters of the respective solution were applied to three groups of 15 plants each once a week for seven weeks. Visual analysis of the low nitrate group has shown stunted growth (h=40 cm) and chlorosis, both of which can be attributed to nitrogen deficiency. Growth of the high nitrate group exceeds that of the medium nitrate group (h=72 and 55 cm, respectively), but coloration in both groups are normal. Photosynthesis rates were measured in randomly selected plants at nine levels of photon flux density ranging from 0 to 2000 µmols m^{-2} s^{-1} using a LiCor 6400. Temperature and CO_2 concentration were held constant. Initial observations show that the maximum carbon assimilation rates are greatest in the high nitrate group, followed by the medium and low nitrate groups (A_{max}=30.4 ± 4.4, 27.7 ± 4.2, and 17.9 ± 1.7 mmol CO_2 m^{-2} s^{-1}, respectively). Light compensation points in the high, medium, and low nitrate groups are 16.5 ± 8.5, 13.4 ± 2.5, and 3.07 ± 2.92 mmols m^{-2} s^{-1}, respectively. Respiration rates in the high, medium, and low nitrate groups are 0.800 ± 0.255, 0.762 ± 0.218, and 0.202 ± 0.197 µmol CO_2 m^{-2} s^{-1}, respectively. These observations support the hypothesis that photosynthetic response is influenced by nitrate availability.

BOARD 12 CARRION-FREQUENTING ARTHROPOD COMMUNITIES ACROSS AN URBAN GRADIENT IN OXFORD, OHIO. **ROBIN A. LEWIS LEWISRA@MUOHIO.EDU, AND BRUCE A. STEINLY STEINLBA@MUOHIO.EDU, DEPT OF ZOOLOGY, MIAMI UNIVERSITY, OXFORD OH 45056**

Previously, several biological diversity investigations have been completed across an urban gradient in Oxford, Ohio that includes sites at a business district, an apartment complex, a residential area, a golf course, an open-space reserve, and a forest preserve. During the summer of 2002, arthropod communities were sampled weekly at each site from June 8 - August 2 using rat carrion, which was tied to the underside of a screened trap, to attract a specific suite of arthropods. Samples from plastic cups containing ethylene glycol were collected, sorted, and specimens were identified to morphotype. Hypotheses were that arthropod richness, abundance, and diversity would peak at the site of intermediate anthropogenic influence (i.e., the golf course). From the most complete data set, the week of June 18 - 25, morphotype richness and abundance were tabulated and Shannon-Wiener Diversity Indices (H') were calculated. Among all sites, 90 morphotypes were present with the most abundant families in the Coleoptera (beetles), Diptera (two-winged flies), and Hymenoptera (bees, wasps, and ants). Richness and abundance peaked at the golf course with 52 morphotypes and 1,152 individuals, respectively. While, diversity was the highest (SDI = 2.89) at the rural forest preserve, which yielded the second highest richness (N = 45) but the lowest number of individuals (N = 375). The lowest richness occurred at the apartment complex, which had the second lowest abundance (N = 449), and the lowest diversity (SDI = 2.09).

BOARD 13 EVALUATING GRAIN-SIZE-BASED EMPIRICAL ESTIMATES OF HYDRAULIC CONDUCTIVITY FOR A GLACIAL-OUTWASH AQUIFER IN SOUTHWESTERN OHIO. **FRANK T. FARRUGGIA FRANK_FARRUGGIA@HOTMAIL.COM, JONATHAN LEVY LEVYJ@MUOHIO.EDU, KERANG SUN, DEPT OF GEOLOGY, MIAMI UNIVERSITY, OXFORD OH 45056**

To predict well yields, drawdown and contaminant transport through an aquifer, it is necessary to quantify such aquifer characteristics as hydraulic conductivity (K). K is controlled by the size and connectivity of an aquifer-medium's pores, and is therefore related to the medium's grain-size distribution and degree of sorting. Many models have been published that use grain-size characteristics to predict K. The goal of this research was to assess the applicability of ten of these models for glacial-outwash sediments from an aquifer in Hamilton County, Ohio. The sediments were collected in cores and the hydraulic conductivity of the 19 cores was directly measured with a constant-head permeameter. The cores were then broken down for standard grain-size analysis. For each core, the 10 published mathematical models were applied which based their K estimates on porosity, d10, d50 and percents gravel, sand, silt, clay and organic matter. The predictions for each model were compared to the measured values. Based on comparison of the means derived for all the cores, the Slichter, Terzaghi and Sauerbrei methods were the best at estimating hydraulic conductivity. Based on the model's ability to accurately capture the measured variability among the cores, the Sauerbrei and the USBR methods performed the best. None of the models tested performed well in both respects. We developed a new mathematical model that out-performed the published models and found that for this sediment, hydraulic conductivity was positively correlated ($r^2=0.62$, $p<0.05$) the percent gravel and, to a lesser degree the square of the d10.

BOARD 14 CHANGES IN FOREST DIVERSITY AT AULLWOOD AUDUBON CENTER AND FARM IN SOUTHWESTERN OHIO FROM 1978 TO 2002. **JOSEPH M. ULLMER OZZ11@AOL.COM, (TIMOTHY L. LEWIS TLEWIS@WITTENBERG.EDU) AND JOHN WILSON JOHN.WILSON@GEMAIR.COM, WITTENBERG UNIVERSITY, DEPT. OF BIOLOGY, 474 ½ NORTH WITTENBERG AVE, SPRINGFIELD OH 45504**

Ohio's forests have been impacted by historic cutting to clear for agriculture and human habitation. Despite conservation efforts, forests remain fragmented in Ohio. Aullwood Audubon Center and Farm, located in southwestern Ohio, is an environmental education center consisting of typical woodlots. The area is dominated by maple (*Acer* spp.), ash (*Fraxinus* spp.), and cherry (*Prunus* spp.). Assessment of recent change in numbers of individuals representing various tree genera, as well as variation in their distribution, can provide information on woodlot community dynamics. We divided one Aullwood forest that is managed for maple syrup production into 65 permanent 5-meter radius plots, each separated by 25 meters. We identified each tree species, measured basal area, and recorded position in 1978, 1991, and 2002. Density, frequency, and dominance of the tree species were calculated. In 1978, the forest was characterized by the predominance of *Fraxinus* spp. (25% of all tree species observed), *Prunus* spp. (16%), and *Acer* spp. (15%). Over the next decade, these genera, in addition to hackberry (*Celtis occidentalis*) and hickory (*Carya* spp.) increased significantly. For example, *Prunus* spp. experienced an increase of 100%, 71%, 190%, and 91% in density, frequency, absolute dominance, and relative dominance, respectively. Between 1978 and 2002, *Acer* spp. demonstrated the largest changes, with 1700%, 210%, 37%, and 20% increases in the same respective categories. A current survey of these plots and the corresponding analysis will provide insight

into the dynamics of the woodlot and the resulting information can be used to better understand changes in forests over time.

BOARD 15 THE ROLE OF INTERSPECIFIC COMPETITION AT WOODPECKER NEST SITES: COMPARING BURN VERSUS UNBURNED TREATMENTS IN THE BLACK HILLS, SD. IAN M. BROWN IBROWN@MUSKINGUM.EDU , KERRI T. VIERLING KERRI.VIERLING@SDSMT.EDU, DALE GENTRY GYRDALE@HOTMAIL.COM, MUSKINGUM COLLEGE, DEPT OF BIOLOGY, NEW CONCORD OH 43762, AND SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY.

Woodpeckers play an essential role in forest ecosystems since their abandoned cavities provide shelter and nest sites for many bird and woodpecker species. Suitable nest cavities are limited and frequently are the focus of intense interspecific competition. The presence of dead trees (snags) are an important component of forest ecosystems since their presence is often tied to an increase in the abundance of many woodpecker species. The focus the research was to compare woodpecker preferences for nesting in burned versus unburned sites in southwestern South Dakota, and to determine whether fire suppression promotes competition among cavity-nesting species. Active woodpecker cavities were located by following adults to their nest and through vocalizations. Locations of active nest trees were recorded with a Global Positioning System unit and the nest contents were monitored every 2-3 days with an extended cavity viewer. In addition, each cavity was observed between 0600-1500 hours for a minimum of 30 minutes during each visit. All interspecific competitive encounters among woodpecker and/or other species were tallied during each visit. The most predominant species on burned sites were red-headed (*Melanerpes erythrocephalus)* (26%) and Lewis' woodpeckers *(Melanerpes lewis)* (53%), while the predominant species on unburned sites were red-breasted nuthatches *(Sitta canadensis)* (25%) and hairy woodpeckers (*Picoides villous)* (50%). The number of competitive interactions (N=1-25) of all woodpecker species at nest trees on burned sites (69%) was significantly greater ($P < 0.05$) than on unburned areas. These data suggest that the Lewis' and red-headed woodpeckers showed a preference for nesting in recently burned areas which were more open, while red-breasted nuthatches preferred unburned areas with a greater understory and fewer snags.

BOARD 16 MACROHABITAT ASSOCIATIONS OF NEST-SITE SELECTION FOR PRIMARY CAVITY-NESTING BIRDS IN THE BLACK HILLS, SOUTH DAKOTA. JOHN W. DOUDNA JDOUDNA@MUSKINGUM.EDU, (JAMES L. DOOLEY JR. JDOOLEY@MUSKINGUM.EDU), MUSKINGUM COLLEGE, 163 STORMONT ST, NEW CONCORD OH 43762

The hypothesis of this study is that correlations exist between nest-sites (nest trees in which primary cavity-nesters (PCNs) excavate their nest cavities) and macrohabitat characteristics, such as amount of and distance to edge, openings, trails, and roads. Geographic Information Systems (GIS), ArcView 3.1, will be used to analyze positions of PCN nest trees, in burned and unburned forests, located in the Black Hills, South Dakota. Transects were established in May of 2002 to survey the desired area within the unburned and burned forests. These transects were each approximately 1.6 km by 200 m. Multiple transects were established to form an uninterrupted area of survey. GPS locations of nest trees, PCN species, and tree characteristics were collected. The presence of active PCN nest cavities in each area suggests that all surveyed areas are able to support PCN communities. Follow-up visits were made weekly until fledging or failure of the nests, to observe behavior and establish clutch sizes. The GPS coordinates have been plotted in ArcView 3.1 for analysis. At the completion of this research project, it will be ascertained if there are macrohabitat-scale characteristics that can be statistically correlated to PCN nest sites. This information may provide evidence to support macrohabitat selection of nest-sites by primary cavity-nesters. This information may help to provide a better understanding of the habitat preferences of PCNs, thereby giving managers information necessary to create and sustain suitable habitats for PCN nesting.

BOARD 17 THE EFFECTS OF FIRE ON INVASIVE PLANT SPECIES AND THE WOODPECKER COMMUNITY IN THE BLACK HILLS, SOUTH DAKOTA. MARIAH J. HOLDEN MHOLDEN@MUSKINGUM.EDU AND SHIRLEY J. ATKINSON SHIRLEYA@MUSKINGUM.EDU, CONSERVATION SCIENCE PROGRAM, MUSKINGUM COLLEGE, 163 STORMONT ST., NEW CONCORD OH 43762

Conservation biology now recognizes exotic species as second only to habitat destruction in the loss of biodiversity because of their contribution to native species extinction. Natural disturbance factors can facilitate the invasion and establishment of non-native species. A disturbance such as fire, which can alter the vegetation structure, could have a major affect on the cavity nesting bird community, an important part of the forest community. Research was conducted in the Black Hills of South Dakota during July and August 2002 to compare invasive plant species coverage and abundance with evidence of woodpecker presence at sixty random points in three different treatment types: new burn, old burn, and unburned. It was hypothesized that disturbed areas would have a higher abundance of invasive plant species than undisturbed habitat, and that areas containing invasive plant species would have a negative effect on woodpecker presence. Data reveals that invasive plant species coverage relative to total plant coverage was significantly greater in the new burn treatment relative to the old and unburned treatments ($0 = 0.00242 \pm 0.00358$ vs. 0.000123 ± 0.000303 and 0.0000392 ± 0.000119; $n=20,20,20$; $F=8.52$, $d.f.=57$; $p=0.05$). However, difference in invasive species coverage did not affect woodpecker presence. These results suggest that newly burned areas are indicative of greater invasive plant species abundance and coverage than unburned areas, but it appears that the presence of invasive plant species does not have an adverse affect on woodpecker presence.

BOARD 18 SURVEY OF TURTLE SPECIES IN RECLAMED HABITATS, MUSKINGUM COUNTY, OHIO. MARCIE L. HORSKY, (JIM DOOLEY JDOOLEY@MUSKINGUM.EDU), CONSERVATION SCIENCE PROGRAM, MUSKINGUM COLLEGE, 163 STORMONT ST., NEW CONCORD OH 43762

The Appalachian region of southeastern Ohio has been subject to surface mining for coal followed by a period of reclamation. The importance of the effects of reclamation on aquatic habitats and species within these habitats is the motivating agent for this research. Because turtles are generally slower at recovering from disturbance than mammals and birds, they are ideal subjects for studying the effects of re-colonization. Turtles were trapped in several lakes at The Wilds, in Cumberland, Ohio during the 2001 and 2002 summer and fall seasons using floating turtle traps and nylon hoop traps. All individuals were marked using either Cagles shell notching sequence with a pair of front-cutters or tagged with 5/8-inch small animal tags along the rear edge of the carapace (soft-shell turtles). In addition each individual was identified, weighed, measured and sexed. To date the following species and capture numbers have been recorded: Chrysemys picta (18), Chrysemys scripta (1), Chelydra serpentina (12), Terrapene Carolina (16), and Trionyx spiniferus (7). The species richness and diversity of these turtle populations are important in determining the significance of the species related to re-colonization after a period of mining and reclamation on the land. The presence of these species indicates the reclamation process was adequate for re-establishing freshwater habitats and their biotic communities.

BOARD 19 COST-BENEFIT ANALYSIS OF THE REINTRODUCED PENNSYLVANIA ELK HERD. JASON E. KAY, (JIM DOOLEY JDOOLEY@MUSKINGUM.EDU AND SHIRLEY ATKINSON SHERLEYA@MUSKINGUM.EDU) MUSKINGUM COLLEGE, 163 STORMONT ST., NEW CONCORD OH 43762

Pennsylvania's elk were extirpated in 1852. In an effort to re-establish a huntable population of elk within the state, the Pennsylvania Game Commission (PGC) embarked on a reintroduction program that began in 1913 and lasted until 1926. During this 14-yr period, 177 Rocky Mountain Elk (*Cervus elaphus nelsoni*) were trapped and translocated from Yellowstone National Park, a private reserve in South Dakota, and a private reserve in Monroe County, PA to various release sites within the state. Using the centralized Pennsylvania elk herd in Benezette, located in Elk County. Considered by many to be the heart of elk country. The following questions will be addressed: "What is the importance of reintroducing the elk to part of their nature range? How have the stakeholder attitudes and life long residents of the area changed over time? How have these changes affected the reintroduction?" The mission statement of the Pennsylvania Game Commission is to manage the herd to maintain a self-sustaining population in a natural state for public benefit. Important relationships between private and public stakeholders will be investigated, as well as how their attitudes have changed over time. The project will be carried out in cooperation with The PGC, Dept of Conservation and Natural Resources, and the Bureau of Forestry. My methodology to evaluate perceptions regarding the reintroduction program will be done by a mail questionnaire mailed out to business and landowners. In addition, follow up interviews will take place with stakeholders during the fall of 2002.

BOARD 20 LIFETIME ESTIMATES OF THE COSTS OF INBREEDING IN CAPTIVE POPULATIONS OF CARACAL (*CARACAL CARACAL*). MOLLY EGGLESTON MOLLYE@MUSKINGUM.EDU, (JAMES L. DOOLEY JDOOLEY@MUSKINGUM.EDU AND SHIRLEY ATKINSON SHIRLEYA@MUSKINGUM.EDU), CONSERVATION SCIENCE PROGRAM, MUSKINGUM COLLEGE, 163 STORMONT ST, NEW CONCORD OH 43762

Conservation science has emerged as one of the most important fields in contemporary biology. Loss of genetic diversity, both in wild and captive populations, raises concerns about the potential impact of inbreeding, genetic bottlenecks, and founder effects. Wildlife preserves and zoos have attempted to address this problem by creating studbooks, biological databases, which can be used to determine family lineages and relatedness among individuals of the same species. Data

from these sources can be used to plan optimal mate pairings in species with low populations numbers thus minimizing the deleterious effects of inbreeding. Inbreeding causes low fertility, low juvenile survivorship, birth defects, and increased vulnerability to disease. The objective of this research is to analyze studbook data for the captive population of caracal (*Caracal caracal*), a small African felid, maintained in forty-one North American facilities. Analysis will look for associations between degrees of relatedness and measures of fitness. It is expected that mating pairs that are closely related in family lineage will produce offspring that have lower fertility, lower juvenile survivorship, birth defects, and an increased vulnerability to disease. These deleterious effects will also be used as measures fitness in this study. In doing this it is being suggested that lower fertility, lower juvenile survivorship, birth defects, and increased vulnerability to disease are good measures of how fit an individual is in a population.

BOARD 21 MICROHABITAT PREFERENCES OF LEWIS' AND RED-HEADED WOODPECKERS IN THE SOUTHERN BLACK HILLS AND WIND CAVE NATIONAL PARK, SOUTH DAKOTA. ERICKA J. PILCHER, ERICKAPILCHER@YAHOO.COM (SHIRLEY ATKINSON SHIRLEYA@MUSKINGUM.EDU), MUSKINGUM COLLEGE, 163 STORMONT ST, NEW CONCORD OH 43762

In order to better understand habitat preferences among woodpeckers, a study was conducted in the summer of 2002 in a forested area that had been burned in 1991. The study site was located in the southern portion of the Black Hills National Forest on the western edge of Wind Cave National Park, South Dakota. Cavity nesters prefer older burnt trees and snags because they can be more easily excavated for nesting, roosting, and feeding than live trees. Objectives of the study were: (1) to determine if there was a difference in vegetation structure surrounding nesting trees and random trees, (2) to correlate the location of woodpecker nesting trees to the vegetation surrounding those trees, and (3) to compare the microhabitat preferences of Lewis' (*Melanerpes lewis*) and Red-headed (*Melanerpes erythrocephalus*) woodpeckers. Habitat characteristics including overstory cover, tree condition, and ground cover were recorded at 25 random tree plots and 26 woodpecker tree plots (7 Red-headed, 19 Lewis'). Preliminary analysis suggests that vegetation structure differs between random and nesting tree plots. However, there is little evidence of structure differences in vegetation between Lewis' and Red-headed woodpecker nesting plots.

BOARD 22 A COMPARISON OF BUTTERFLY POPULATIONS TO DETERMINE SPECIES RICHNESS AND ABUNDANCE IN RECLAIMED AND UNDISTURBED HABITATS IN OHIO. CASSANDRA C. MATTERN CMATTERN@MUSKINGUM.EDU, (JIM DOOLEY JDOOLEY@MUSKINGUM.EDU), MUSKINGUM COLLEGE, 163 STORMONT ST., NEW CONCORD OH 43762

Butterfly communities can be affected by many factors such as predators, climate, human disturbance, host plant availability, and habitat. Butterflies are closely linked to the health of their habitats and are often cited as key bioindicator species. Species richness and abundance relationships of two butterfly populations were examined at two study sites that were superficially similar but differed in land use history. The first site was at the Wilds (an international conservation research and education institution located in Guernsey County, Ohio) in a wetland located on reclaimed strip mined land. The second site was at the McCallister Field Station (a field research station owned by Muskingum College, New Concord, Ohio) in a wetland located in a zone of abandoned farmland. Walk and count transects were used to estimate butterfly biodiversity as well individual species population sizes. Plants that were being utilized by each butterfly species were documented. Sixteen species of butterflies were found across the two sites. Butterfly diversity was relatively similar across the two sites with 16 species identified at the McCallister Field Station. Of those, 11 were also found at the Wilds. The 16 total species found include Black Swallowtail, Cabbage White, Clouded Sulfur, Common Buckeye, Common Roadside Skipper, Common Wood Nymph, Easter Tailed Blue, Eastern Tiger Swallowtail, Great Spangled Fritillary, Monarch, Orange Sulfur, Pearl Crescent, Pink-Edged Sulfur, Red Spotted Purple, Silver Spotted Skipper, and Viceroy. Sizes were also relatively similar across the two sites with the greatest abundance in the same four species at both sites. Other analyses continue.

BOARD 23 A COMPARISON OF BEHAVIOR OF CHINESE GORAL (NEMORHAEDUS GORAL ARNOUXIANUS) AT THE WILDS AND IN NATIVE HABITATS. JENNIFER LOCKARD JLOCKARD@MUSKINGUM.EDU, (JIM DOOLEY JDOOLEY@MUSKINGUM.EDU AND SHIRLEY ATKINSON SHIRLEYA@MUSKINGUM.EDU), 163 STORMONT ST., NEW CONCORD OH 43762

The purpose of this research is to conduct a behavioral analysis of captive Chinese goral (*Nemorhaedus goral arnouxianus*). Chinese goral are a relatively understudied species, in both the wild and captivity, native to the mountains of central Asia. The objectives are: (i) determine how goral use the space available to them in their enclosure, (ii) record any interactions between animals of various ages and body size over the access to resources and (iii) attempt to describe and categorize these behavioral interactions. The study site is the Wilds which is a wildlife conservation facility located in southeastern Ohio occupying approximately 9,154 acres of reclaimed strip-mined land. Observations of captive goral living at the Wilds will be structured to collect data on the frequencies of various behaviors; foraging, mating, territoriality and dominance displays, and how the display of such behaviors are associated with space use. Detailed methods will follow protocols described in the Michigan State (2002) Honors Organismal Biology Laboratory exercise titled "Animal Behavior: a Brief Study of Captive, Group-living Vertebrates." The behaviors of the goral will be placed in descriptive categories that are clearly defined. Categories that I will use will be territorial displays (charges, hissing, sneezing), foraging activities (eating and drinking), resting (sleeping or laying down) and socializing (standing with other goral but showing no aggressive behavior). The enclosure will be visually sectioned off and one section will be observed for a set period of time. This will determine how goral use the space available to them.

BOARD 24 THE EFFECT OF STARTER FERTILIZERS ON NORTHWEST OHIO CORN PRODUCTION. EDWIN M. LENTZ LENTZ.38@OSU.EDU, OSU EXTENSION, 1219 W MAIN CROSS ST STE 202, FINDLAY OH 45840-0702

Historically, producers have maintained good soil fertility practices in Northwest Ohio. Many continue to use starter fertilizers without question, and consider P the most important component of a starter fertilizer, even though most fields have more than adequate levels for corn production. It was hypothesized that N is more important than P for starter fertilizers. To test this hypothesis, a three-year fertilizer study was completed to evaluate the importance of N and P as starter nutrients. Two field sites were selected on Hoytville clay soils that had the rotational and tillage practices used in the region for a corn-soybean and a corn-soybean-wheat rotation. Soil test P levels were above 35 ppm on those fields. Experimental design was a completely randomized block with four replications. Each replication included nine treatments: urea, ammonium sulfate, and diammonium phosphate (DAP) at 20 and 45 lb/A N rates; triple phosphate to equal the P rate in DAP; and a zero starter check. Plots were 10 feet wide and 75 feet long. Starter fertilizer was applied at planting in bands about two inches to the side and below the seed. Six weeks after planting, the height of 10 plants was measured to the top leaf collar and 10 whole plants were collected for N analysis from each plot. After samples were collected, urea-ammonium nitrate was added to each plot so the sum N total was 150 lb/A. Grain yield and moisture were measured at harvest. Only two sites of the six-site years had treatments with yields larger than the zero check. Of these treatments, only those with N had larger yields. Even when a yield increase was not detected, starter N treatments had more growth and greater tissue N than the zero check. This study showed that N was responsible for yield increases from starter fertilizers, and P did not contribute to yield on clay soils with medium to high soil test P levels.

BOARD 25 A STUDY OF FEATHER-DEGRADING *STREPTOMYCES* ISOLATED FROM AVIAN SOURCES. PATRICIA B.S. CELESTINO PBCELEST@OWU.EDU, NGA P. NGUYEN NPNGUYEN@OWU.EDU AND JANN M. ICHIDA JMICHIDA@OWU.EDU, DEPT OF BOTANY/MICROBIOLOGY, OHIO WESLEYAN UNIVERSITY, DELAWARE OH 43015

The feather waste produced from poultry industry is 90% beta keratin, rich in carbon, nitrogen and amino acids. *Streptomyces* are bacteria commonly found in soil. Keratin-degrading strains have been isolated from avian plumage, nests and poultry compost. We studied the morphology, color, microbial interactions, ability to degrade feathers and other physiological characteristics of 42 strains of *Streptomyces* from the Ohio Wesleyan collection. Morphology of the mycelium and spores was determined by light and scanning electron microscopy. Actinomycete agar plates were also used to assign a standard color to both aerial and reverse mycelium. Tryptone yeast broth and basal feather or snake skin medium were used to detect specific keratinase activity and pigment production, Mueller-Hinton plates for microbial interactions and antibiotic production, blood agar and basal medium for hemolytic action and carbon utilization by *Streptomyces*. Our *Streptomyces* collection varies widely in morphology and color. In three trials strains 3101 and 1633 produced broad-spectrum antibiotics active against gram positive and gram negative bacteria. When testing *Streptomyces* for their antibiotic susceptibility these same two strains were also resistant to clindamycin and may produce this class of antibiotics themselves. Although all 42 strains were capable of degrading feather keratin by day 21, twelve degraded feathers in less than seven days. *Streptomyces* colonized and degraded black feathers earlier than white feathers. Beta scales but not alpha keratin sections of snake skin were colonized by the bacteria. This specificity of keratinolytic bacteria may be useful in the study of evolution of feathers from modified beta keratin scales.

BOARD 26 LANDSCAPE CHARACTERIZATION OF THE NIAGARA ESCARPMENT IN SOUTHWESTERN

OHIO BY USE OF GEOGRAPHIC INFORMATION SCIENCE TECHNOLOGY. PATRICK L. LAWRENCE PLAWREN2@UTNET.UTOLEDO.EDU, SYLVIA-LINDA KAKTINS SKAKTIN@UTNET.UTOLEDO.EDU, ADAM DEMARS ADAM2684@YAHOO.COM, UNIVERSITY OF TOLEDO, DEPT OF GEOGRAPHY AND PLANNING, TOLEDO OH 43606

The Niagara Escarpment is an erosional feature formed in Palaeozoic strata that extends from western New York State, north into Ontario, Canada, across Lake Huron into northern Michigan, and south through eastern Wisconsin. The Escarpment is identified in terms of its geological origin and presence as a surface feature present on the landscape in the form of a distinct vertical cliff face. Remnant portions of the Niagara Escarpment also exist within southwestern Ohio from Dayton, southeast to Portsmouth. Within this region the Niagara Escarpment takes the form of a subtle ridge or irregular topography and is also present as surface exposures along major river channels, quarries, or road cuts. It is also possible to describe the Niagara Escarpment in terms of a range of associated biotic and cultural characteristics including topography, vegetation types, microclimate conditions, drainage systems, and human activities. The goal of the study is use geographic information science (GIS) technology to identify, map, and assess the distribution of those characteristics that would identify the Niagara Escarpment in southwestern Ohio as a separate landscape feature. Results indicate that surface water drainage, soil types, and forest vegetation distribution, allow for the landscape characterization of the Niagara Escarpment in southwestern Ohio. An unsupervised land cover classification of Landsat satellite imagery revealed the presence of a variety of associated land uses along the Escarpment including agricultural practises. The study will contribute to ongoing activities within the Great Lakes region to further bioregional planning and conservation efforts in regards to the Niagara Escarpment.

BOARD 27 EFFECT OF MODIFED RELAY INTERCROPPING (MRI) ON WHEAT YIELD. S.C. PROCHASKA PROCHASKA.1@OSU.EDU, OHIO STATE UNIVERSITY EXTENSION, 117 E MANSFIELD ST, BUCYRUS OH 44820

Modified relay intercropped wheat grown in 15-inch rows will yield less than wheat alone. The level of yield difference is important to producers in wheat/soybean double crop systems. A completely randomized design (6 replications) in small plots (5.5 x 50 feet) was used to evaluate the effect of MRI on wheat yield. Treatments were 15-inch row wheat and 15-inch row wheat interseeded with soybeans. Wheat and soybeans were planted with a three-point hitch mounted tool bar planter equipped with Sunflower openers. Soybeans were interseeded into wheat in early June with the same planter used to plant wheat. Wheat harvest was done in late June or early July with a small plot combine. Over the three year trial period, relay intercropped wheat averaged 67.1 bushels per acre versus 75.6 bushels per acre for wheat alone. This yield difference of 8.5 bushels per acre between wheat in 15-inch rows and wheat interseeded in 15-inch rows was slightly larger (about 1 bushel per acre) than expected. This result may have been due to the wide wheat rows (7 to 10 inch row wheat is traditional) and damage to wheat while intercropping.

BOARD 28 DISSOLUTION OF IRON COMPOUNDS IN ACIDIC CONDITIONS TO DETERMINE SURFACE COMPOSITION USING ATOMIC ABSORPTION SPECTROSCOPY. JENNIFER S. GRZYBOWSKI BILLIES41@AOL.COM, UNIVERSITY OF PITTSBURGH, 15 EDITH PLACE, PITTSBURGH PA 15213, DR. MICHAEL P. SETTER MSETTER@JCU.EDU, JOHN CARROLL UNIVERSITY

The power in a battery is limited by the ability of ions to cross the surface barrier of powders under the conditions in the battery. If the surface composition can be determined, the method of making batteries might be optimized that ions can more easily cross the surface barrier, therefore increasing the battery's power. By monitoring the change in the composition of a solution as a powder is dissolving in it, the surface composition of the powder can be determined. This dissolution pattern is measured over time, before and after the addition of a powder, such as iron(III) oxide, to the solution. Atomic absorption spectroscopy (AA) is utilized to measure the absorbance of iron present in the solution. As the powder dissolves, a 20 mL aliquot is withdrawn from the solution every 30 seconds for the duration of the 45-minute experiment. Prior to withdrawal, each aliquot passes through a dialysis membrane to prevent powder from being introduced into the AA. Each aliquot is analyzed using air/acetylene flame atomization with a micro sampling technique. From 15 trials it was found that iron (III) oxide does not dissolve appreciably in either 10% nitric acid or 10% hydrochloric acid. This was confirmed via graphite furnace atomization, which has a significantly lower detection limit than air/acetylene flame atomization. Iron (II) sulfide dissolves in 10% nitric acid and its dissolution pattern, both qualitatively and quantitatively, is currently being studied.

BOARD 29 PRELIMINARY REPORT ON TWO LONG-TERM REPTILE POPULATION STUDIES AT THE J.H. BARROW FIELD STATION: TURTLES AND SNAKES. SAMUEL D. MARSHALL[1] MARSHALLSD@HIRAM.EDU, ALLISON FERRIS[1], MEAGAN HARLESS[1,2], AND WALTER MESHAKA[3], [1]J. H. BARROW FIELD STATION, DEPT. BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234, [2]MISSOURI DEPT OF CONSERVATION, [3]THE STATE MUSEUM OF PENNSYLVANIA

We report on the preliminary results of two long-term reptile population monitoring studies currently underway in Hiram Township, Portage County. The first is a cover board study of snake populations initiated in the spring of 2000 and the second is a trapping survey of the turtle population of an artificial 1.0 ha pond initiated in the fall of 2001. The cover board array consisted of three 10-board arrays comprised of 1.22 by 1.22 m pieces of 1.27 cm thick exterior grade plywood. We captured snakes under the boards and *ad hoc* by hand and measured and immediately released them where they were captured. Species captured were eastern garter snake (*Thamnophis s. sirtalis*), northern brown snake (*Storeria d. dekayi*), northern redbelly snake (*Storeria o. occipitomaculata*), black rat snake (*Elaphe o. obsoleta*), northern water snake (*Nerodia s. sipedon*) and eastern milk snake (*Lampropeltis t. triangulum*). Snakes greater than 20.0 cm snout-vent length were also PIT (passive integrated transponder) tagged using AVID Musicc Chip Identification System tags (AVID Identification Systems Inc., Norco, CA). We tagged 26 garter snakes, 7 milk snakes, 1 brown snake, 1 water snake and 1 black rat snake. We used two types of turtle traps: hoop-net traps baited with sardines in the fall, and passive basking traps in the early summer. We captured both midland painted turtle (*Chrysemys picta marginata*) and common snapping turtle (*Chelydra s. serpentina*) using both methods. We tagged a total of 65 painted turtles and 3 snapping turtles.

BOARD 30 CENSUS FROM AVIAN POINT COUNTS AND MIST-NETTING AT J. H. BARROW FIELD STATION, HIRAM TOWNSHIP, OH, 2002. GREGG A. KELLY KELLYGA@HIRAM.EDU, J. H. BARROW FIELD STATION, HIRAM COLLEGE, 11305 WHEELER RD., GARRETTSVILLE OH 44231.

A total of five point counts and six mist-netting sessions were conducted at the J. H. Barrow Field Station at ten-day intervals from 27 June – 9 August 2002, to census the avian community. Point counts covered approximately 260 acres of varied habitat and consisted of 18 stations where surveyors recorded all birds detected visually and aurally. A total of 1167 individuals, comprised of 60 species, were found on the counts. The largest numbers of individuals and species recorded from a single count were 286 and 46, respectively. Red-eyed Vireos (*Vireo olivaceus*) had the highest number of total individuals recorded (91) and were found on a greater percentage of points (69%) than any other bird. The ten most abundant birds comprised 54% of all individuals counted. Results show little change in the avian community since a previous census ten years earlier. Mist-netting was conducted within 25 acres of beech-maple forest, using 5-7 nets for a total of 174.5 net hours. Seventy-nine individuals of 19 species were caught, giving 0.45 birds/net hours. Gray Catbird (*Dumetella carolinensis*) was the most-caught bird (14 captures), followed by Acadian Flycatcher (*Empidonax virescens*) (10) and Song Sparrow (*Melospiza melodia*) (9). Juveniles comprised 13% of all birds captured.

BOARD 31 NATURALIZING AN ARTIFICIAL POND: A PROGRESS REPORT. MATTHEW J. ASHTON ASHTONMJ@HIRAM.EDU, AND SAMUEL D. MARSHALL MARSHALLSD@HIRAM.EDU, J. H. BARROW FIELD STATION, DEPT BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234.

Aquatic diversity is lacking in the Nature Observatory (OB) Pond located at the James H. Barrow Field Station (Hiram Township, Portage Co.). The OB pond is 2.48 acres, and was created in the late 1960s. It has a maximum depth of 4.2 m. I formally observed this lack of diversity in May 2002, seeing only shoals of bluegill (*Lepomis macrochirus*), and large populations of larval and adult bullfrogs (*Rana catesbiana*). Our long-term goal is to engineer the pond, to increase specie diversity and richness through the introduction of predator species of fish, as well as physical habitat enrichment. Our hopes are that this method will lower the large, stunted bluegill and bullfrog population, thus allowing an increase in other aquatic species. Baseline data of the species density was recorded prior to and after habitat enrichment by using an AquaviewÔ camera, covering selected areas over a 2-minute period. Bluegills were seen in greater numbers around artificial habitat than open areas one month after placement. Artificial habitat included log piles, brush piles, straw bales, and lattices of cubical terra cotta. Introduction of predatory fish was followed guidelines set forth by the ODNR, including 150 largemouth bass (*Micropterus salmonoides*) and 25 northern pike (*Esox lucius*). Following this initial treatment of the pond I outlay a long-term methodology to monitor the aquatic community as it changes.

BOARD 32 A COMPARATIVE STUDY OF TWO METHODS FOR MEASURING TERRITORY SIZE IN A NEOTROPICAL MIGRANT SONGBIRD, *EMPIDONAX VIRESCENS*. RACHAEL D. NASH[1] NASHRD@HIRAM.EDU, (COURTENAY N. WILLIS[2] CNWILLIS@CC.YSU.EDU, AND SAMUEL D. MARSHALL[1] MARSHALLSD@HIRAM.EDU), [1]J.H. BARROW FIELD

STATION, DEPT. BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234, [2]DEPT OF BIOLOGICAL SCIENCES, YOUNGSTOWN STATE UNIVERSITY
The Acadian Flycatcher, *Empidonax virescens*, is a Neotropical migrant songbird that breeds in mature deciduous forests, primarily Beech-Maple. Males return in early spring to establish territories and attract a mate. In 2002, the territory size of male Acadian Flycatchers was studied at the J.H. Barrow Field Station, Hiram Township, Portage Co. The purpose of this research was to compare the accuracy of utilizing GIS methodology versus Herron's formula to estimate the area size of a bird's territory. Spot-mapping was used to locate an individual's territory. Trees that were used as perch sites by singing males were subsequently flagged. Trees located on the perimeter of an individual's territory were used to estimate territory size in two ways. First, Herron's formula was used to estimate territory size, where the area occupied by an individual was divided up into geometrical shapes, with distances between perch sites being estimated using meter tape. Second, GPS was used to determine the location of perimeter trees, and GIS methodology was used to estimate territory size. Although GIS provides an indirect way of estimating the area size of a bird's territory, it has the benefit of yielding information at a larger spatial scale than the more traditional method. For instance, GIS may be used to examine relationships between nest success, territory size and territory location relative to selected landscape-level features.

BOARD 33 BASS ISLANDS' IDENTITY CRISIS AND A POSSIBLE SOLUTION. MARK A. KLEFFNER[1] KLEFFNER.1@OSU.EDU, GLENN E. LARSEN[2] GLENN.LARSEN@DNR.STATE.OH.US, [1]DEPT OF GEOLOGICAL SCIENCES, OHIO STATE UNIVERSITY AT LIMA, 4240 CAMPUS DR, LIMA OH 45804-3576 AND [2]OHIO DEPT OF NATURAL RESOURCES, DIVISION OF GEOLOGICAL SURVEY
The name Bass Islands Series was originally proposed for rocks disconformably underlying the Sylvania Sandstone and overlying the Salina in southern Michigan and northwestern Ohio by Lane, Prosser, Sherzer and Grabau in 1909. The four units they recognized as comprising the Bass Islands Series were defined based on faunal content and superposition. No lithologic descriptions were given for any of the Bass Islands units until work by Carman in 1927, and none of the contacts were defined. The Bass Islands is currently defined two ways. The Bass Islands Group, composed of the Put-in-Bay and Raisin River Dolomites, is recognized at surface exposures. The primary characterisitic used for the last fifty years to recognize the Bass Islands Group is its brecciated nature. However, for at least the last 30 years, those breccias have also been recognized as post-depositional paleokarst features that occur on a regional scale and likely also cut formational boundaries. The unit is recognized as a formation, the Bass Islands Dolomite, in the subsurface, where it is defined as the interval suprajacent to the uppermost anhydrite of the G unit of the Salina and subjacent to the Silurian-Devonian unconformity. In part as a result of the uncertainty associated with an identity for the Bass Islands, recent workers have suggested that perhaps the Bass Islands Group/Dolomite is a part of the Salina, or that the Bass Islands is actually missing from western Ohio, and that units recognized as Bass Islands in that region are the Lower Devonian Helderberg Formation. One sample taken from the Raisin River Formation yielded over 30 identifiable conodont elements representative of *-Ozarkodina remscheidensis, O. excavata, Panderodus* sp. and *Belodella* sp., species typically represented in upper Silurian strata, including the Tymochtee Dolomite and Salina undifferentiated of western Ohio. Processing of additional outcrop and subsurface samples of the Bass Islands for conodonts could provide the solution to the Bass Islands identity crisis.

BOARD 34 NUMBER OF GENES SEGREGATING FOR GENERATION TIME IN A CROSS BETWEEN TWO PARTIALLY RESISTANT LINES OF WHEAT. KARIN A. HANSON KRNAHNSN@HOTMAIL.COM, JEFFREY S. LEHMAN JLEHMAN@OTTERBEIN.EDU, 155 W MAIN ST, DEPT OF LIFE SCIENCES, OTTERBEIN COLLEGE, WESTERVILLE OH 43081
This study describes the segregation of genes for resistance to the fungus *Puccinia triticina* in a cross between partially resistant wheat CI 13227 and L-574-1. Previously, L-574-1 and CI 13227 were determined to have two and four genes for partial resistance, respectively. In this study, parental, F1, F2, and backcross populations were used: 1) to quantify maternal inheritance, degree of dominance, and transgressive segregation; and 2) to determine whether CI 13227 and L-574-1 share any resistance genes. CI 13227 and L-574-1 were crossed to produce F1, F2, and backcross populations. Plants were inoculated with *P. triticina* prior to flowering. On days 6-22 after inoculation, disease lesions were counted and used to generate frequency distributions and to calculate average generation times for all populations. Generation times (± SD) for CI 13227, L-574-1, F1, F2, backcross to CI 13227, and backcross to L-574-1 were 12.34 ± 0.80 (n=32), 10.0 ± 0.59 (n=45), 10.59 ± 1.18 (n=26), 10.80 ± 1.74 (n=219), 11.09 ± 1.81 days (n=69), and 10.05 ± 1.53 days (n=70), respectively. No maternal inheritance was observed ($P>0.05$) in reciprocal crosses of the backcross generations. Generation times for 57-77% of the progeny in the F2 and backcross populations were less than or greater than the mean value of the parents. Resistance appeared to be partially recessive based on mean values for the F1 and mid-parent. Segregation patterns and the long generation time of the F1 generation relative to that of the less resistant parent indicated that L-574-1 and CI 13227 share a single major gene that exerts a large effect on generation time. These results indicate that the resistance in CI 13227 and L-574-1 could be combined to create wheat cultivars with slightly greater resistance than either parent.

Pre-College Poster Session 03:00 PM

BOARD 01 TRICLOSAN INDUCED RESISTANCE OF *PSEUDOMONAS AERUGINOSA*. KELLY D. KNAPP CHICA4286@AOL.COM, 7478 GREENFIELD TRAIL, CHESTERLAND OH 44026 (BEAUMONT SCHOOL)
In this experiment, *Pseudomonas aeruginosa* was exposed to the antimicrobial triclosan and then tested against other antibiotics. This was done to see if the triclosan created a resistance in the *P. aeruginosa* not only against the triclosan but also against other antibiotics. Resistance to other antibiotics would make it very hard for doctors to treat these strains of *P. aeruginosa* in patients susceptible to infections such as immuno-compromised patients, Cystic Fibrosis patients, and severe burn victims. *P. aeruginosa* was exposed to the triclosan at different concentrations (2 fold dilutions ranging from 3 000mg/ml to 6mg/ml) using macrobroth dilution techniques. This step was repeated 3 times with the *P. aeruginosa* in order to build its resistance against the triclosan. After each exposure to the triclosan, *P. aeruginosa* was then tested against other antibiotics on a dried Minimum Inhibition Concentration (MIC) tray. The results were then read with a magnifying mirror reader. It turns out that not only did *P. aeruginosa* become resistant to the triclosan but also to various antibiotics such as amikacin, cefepime and ceftazdime. However, was this change chromosomal or plasmid mediated? To determine this, a test called Pulse Field Gel Electrophoresis (PFGE) would need to be run using the DNA of the resistant *P. aeruginosa*. After PFGE was run, it turns out that the change was not chromosomal mediated, which means that the assumption can be made that the change was plasmid mediated. In order to confirm this, a number of other tests against the DNA would have to be run. However, the fact that triclosan is creating this resistance in *P. aeruginosa* should make everyone think about how triclosan is used in our everyday lives, since it is in many antibacterial products. The use of triclosan should not be abused because even though it appears to be helping people stay infection free, it may be creating a dangerous, resistant bacteria.

BOARD 02 CREATING A DECISION-MAKING ROBOT USING A NEURAL NET. ZACHARY J. TONG ZACH@TONG-WEB.COM, 6171 MERE DR, MASON OH 45040 (MASON HIGH SCHOOL)
Artificially intelligent robots are becoming increasingly important in manufacturing, health care, search and rescue, law enforcement, exploration, and fighting terrorism. Many robots are preprogrammed with a defined set of tasks. Robots that learn from their actions and apply the gained knowledge to solve new problems can be used in more complicated applications. The purpose of this project was to build and program a robot that could learn from its decisions to navigate a path. The hypothesis was to determine if a robot could learn to turn left, right, move forward, and stop based on sensory input and previous decisions stored in a neural net. A Lego™robot was designed with a two-wheel drive and a support wheel. Attached to the front was a sliding rack equipped with a light sensor. A series of colored lines was used as a path for the robot's light sensor to follow. Two different programs were coded using Not Quite C (an adapted version of C for the Lego™robot). The first program defined a specific set of tasks for the robot to execute. The second program incorporated a neural net. The neural net enabled the robot to test possible solutions to a problem and remember the correct solution. When the robot encountered the next problem, it referenced the neural net. If the correct solution was available, the robot recalled and executed the appropriate action. Otherwise, the robot tested possible solutions to find the correct one. In conclusion, a robot programmed with neural net logic can remember the solutions required to navigate a path. The robot can then apply those solutions to navigate any path regardless of the path's configuration.

BOARD 03 DO PEOPLE DETECT A FLASHING RED LIGHT BETTER THAN A STILL RED LIGHT? LALI J. REDDY LOLLIPOP504@AOL.COM, 504 GREENBRIER CT, STEUBENVILLE OH 43952 (HOLY ROSARY CENTRAL SCHOOL)
Many automobile accidents occur due to a driver's lack of attention. Flashing brake lights bring more attention to drivers to keep a safe distance behind the automobile in front. Flashing red traffic lights increase a driver's awareness at road intersections. To test whether a flashing light can be detected better than a still light, a scope was designed using the following materials: four switches, two blinking LED's, two LED's, eight AA batteries, one wire, one heat shrink tubing,

one plywood, and two PVC pipes with a diameter of four centimeters each. The finished scope looks like a white wooden box with two projecting eye pieces. In each of the scope's two tubes are flashing and still lights. Flash frequency and brightness of the lights remained constant throughout the study. There are two red switches on either side of the scope. The two parallel switches that are closest to the front of the scope control the flashing lights and the two parallel behind them control the still lights. In order to test the forty-six test subjects, each opposite pair of switches was pressed, making one tube flashing and the other still. The test subjects were asked to look through the scope and identify which side they saw first. Thirty-five test subjects (76.08%) said flashing and eleven test subjects (23.9%) said still. Out of the forty-six test subjects, fourteen (30.4%) were nine or ten years old and thirty-two (69.56%) were twelve or thirteen years old. Out of the fourteen students, twelve (85.7%) said flashing and two (14.28%) said still. Out of the thirty-two students, twenty-three (71.87%) said flashing and nine (28.12%) said still. Out of the entire test subjects, eleven (23.9%) were male. Out of these eleven, eight (72.72%) said flashing and three (27.27%) said still. Thirty-five out of the forty-six test subjects were female. Out of these thirty-five, twenty-seven (77.14%) said flashing and eight (22.85%) said still. Out of the forty-six students, five (10.86%) were left-handed and four (89.1%) were right-handed. As a result, more than three-fourths identified the flashing light and more than 20% identified the still. This data proved that my hypothesis is correct. Gender, age, and right or left handedness had no effect on the overall outcome of the study. This concept confirms the advantages (benefits) of flashing lights in accident prevention.

Board 04 FACTORS AFFECTING ROAD MORTALITY OF SNAKES, KILLDEER PLAINS WILDLIFE AREA. **Nathan J. Yaussy yaussy@yahoo.com, 5051 N Galena Rd, Sunbury OH 43074 (Buckeye Valley High School)**

Surveys of road kills of snakes in the Killdeer Plains Wildlife area had not been conducted before 2000. Actual impact that vehicular traffic may have upon snakes was unknown. Previous fieldwork indicated that virtually all species of snakes in the area are killed frequently by vehicular traffic. Eastern plains garters (*Thamnophis radix radix*) and eastern massasaugas (*Sisturus catenatus catenatus*) are listed as endangered on Ohio's threatened and endangered species list and found in Killdeer Plains Wildlife Area in Wyandot County, Ohio, USA. Serious concerns exist regarding a decline in numbers of threatened and endangered snakes at Killdeer Plains. All roads in the Killdeer Plains Wildlife area were driven twice weekly from March to June and August to November. Snakes were identified, and location recorded by Global Positioning System (GPS). Live snakes were assisted off the road. Fall 2000 and fall 2001 road surveys were compared using a chi-squared test and found to have the same distribution ($p>0.99$). Days of the greatest activity may be linked to a temperature shifts in all periods of collection. The amount of traffic had no beaaring on the number of dead snakes according to a linear regression ($p>0.99$). The lack of snakes found during the months of March to June in the spring of 2002 may be an indicator of a decrease in snake populations. This study was conducted in cooperation with the Ohio Dept of Natural Resources.

Board 05 HOW DO DIFFERENT NUTRIENTS (PHOSPHORUS/NITROGEN/POTASSIUM) AT VARIABLE CONCENTRATIONS AFFECT ALGAE (*CLADOPHORA SP.*), AND THE AQUATIC PLANTS (*VALLISNERIA SP. AND MYRIOPHYLLUM SP.*), FROM THE WATERS OF LAKE ERIE? **Valerie M. Andrus 05VAndru@Beaumontschool.org, 4880 Foxlair Trail, Richmond Heights OH 44143 (Beaumont School)**

The purpose of this project was to evaluate plant nutrient uptake of the macronutrients, phosphorus, nitrogen, and potassium on the algae (*Cladophora sp.*) and the aquatic plants (*Vallisneria sp.* and *Myriophyllum sp.*), all collected from the southern shore of Lake Erie, by the inlet to Euclid Creek, in Cuyahoga County, Ohio. Aquatic plant species were collected from the surface waters of the shore of Lake Erie, by the Euclid Creek inlet. The algae *Cladophora sp.* was collected from scraping biomass from submerged rocks and wood, in the same location. The control for this project is water collected from Lake Erie. All samples were collected and the test evaluations preformed in September and October of 2001. The variables for this project are: (1) water collected from Lake Erie with plant species added and no additional nutrients, (2) water from Lake Erie with plant species and a 10 ppm dose of N-P-K added, (3) water from Lake Erie with plant species and a 20 ppm dose of N-P-K added. It was hypothesized that of the three plant species, algae (*Cladophora sp.*), which is free flowing and can attach to rocks, gravel, etc., will assimilate a greater amount of nutrients than the aquatic plant species, (*Myriophyllum sp.*), or the deeply rooted aquatic plant species (*Vallisneria sp.*). The algae (*Cladophora sp.*) is adaptable to reproducing and growing in all phases of the habitat (water surface, suspended in water, and upon the gravel). Another expectation was that healthier plants would increase assimilation of the nutrients (N-P-K) in the test containers with the highest nutrient concentration. The procedure for this project had four test trials: (1) all plant species added, (2) *Cladophora sp.*, (3) *Vallisneria sp.*, and (4) *Myriophyllum sp.* Each trial had four test containers, as follows: (a) Lake Erie control water only, (b) Lake Erie water with plant species added, (c) Lake Erie water and plant species with 10 ppm of N-P-K added, and (d) Lake Erie water and plant species with 20 ppm of N-P-K added. Gravel from Lake Erie where the samples were collected was added to each container at a bed level of 2 cm. in depth. The gravel was of grain size (0.101-0.202 cm.) to granule size (0.202-0.406 cm.). The gravel can be characterized as common rock and mineral compositions from the southern shore of Lake Erie, including limestone, dolomite, quartzite, shale, sandstone, siltstone, chert, flint, quartz, coal, and a variety of igneous and metamorphic rock and mineral types. A light source provided illumination throughout the test period. The light source was a plant grow light, of metal halide form, at 150 watts, and producing 16,000 lumens. The following were tested and documented: pH, nitrogen, phosphorus, and potassium concentrations (all in ppm), on all containers after 0 hours, 72 hours (3 days), and 144 hours (6 days). The data for this project indicates that the hypothesis was supported. The *Cladophora sp.* assimilated a greater amount of nutrients (N-P-K) than the aquatic species *Myriophyllum sp.*, and *Vallisneria sp. Cladophora sp.* assimilated 66%-100% of all nutrients (N-P-K) in all tests, especially phosphorus, which was assimilated at 99%-100% in all tests. In conclusion, *Cladophora sp.* was the aquatic plant that was most effective in plant nutrient (N-P-K) assimilation, especially phosphorus. Qualitative analysis of the algae/plants growth and color tend to support the hypothesis and quantitative data derived from the nutrient analysis.

Board 06 A STUDY OF THE POINT WHEN AGE AND SHORT-TERM MEMORY BECOME NEGATIVELY CORRELATED. **McKinsey R. Muir mck1405@aol.com, 8402 Edge Lake Oval, Sagamore Hills OH 44067 (Beaumont School)**

This project focused on the fascinating and controversial topic of short-term memory. The study asked, "is there a point when age and short-term memory of humans become negatively correlated?" The following hypothesis was developed: "there is a point when age and short-term memory become negatively correlated." The MUIR SHORT-TERM MEMORY TEST was formulated. The test requires the subject to study nouns, numbers, and shapes for one minute and then attempt to recall them from memory. Over 100 copies of the MUIR SHORT-TERM MEMORY TEST were administered and evaluated. People in the age-range of 11 to 70+ participated in this study. Subjects were divided according to age into seven groups: 11-20 years, 21-30 years, 31-40 years, 41-50 years, 51-60 years, 61-70 years, and 70+ years. Results of the tests were calculated, charts quantifying the percentage of nouns, numbers, and shapes retained by the subjects were constructed, and conclusions were derived. It was evident from the retention percentages of the seven age groups that the point at which age and short-term memory became negatively correlated was in the age range of 70+. Although the hypothesis was supported, many questions remain concerning the results of the experiment. The most prominent issue was the almost indistinguishable resuits of the first six age groups. No explanation can be offered for why the 70+ age group has such low retention of information as compared with the six other age groups. Perhaps of even greater concern, however, is the reason why there is no gradual degradation in performance of short-term memory over the preceding six age groups.

Board 07 SPACE FLIGHT EXPERIMENT TO MEASURE POLYMER EROSION AND SILICONE CONTAMINATION ON SPACECRAFT. **Maura C. Lillis moey702@aol.com, Allison L. Rapoport OhAngelene@aol.com, Christiane A. Youngstrom starbuck_321@yahoo.com, Sharon Kaminski Skaminski@hb.edu, 1567 Compton Rd, Cleveland Heights OH 44118 (Hathaway Brown School)**

Atomic oxygen (AO), a natural species in the earth's atmosphere, is formed when ultraviolet (UV) radiation photo-dissociates oxygen molecules. AO severely erodes the functional polymeric surfaces of spacecraft, as well as reacts with silicone spacecraft components to create harmful silicone contamination. The Polymer Erosion And Contamination Experiment (PEACE) has been designed to address these two very significant spacecraft problems that occur in the low earth orbit (LEO) space environment. To establish a solution to silicone contamination, the experiment includes silicone contamination pinhole cameras that have been designed to pinpoint the source of contaminants from opposite silicone samples. For AO erosion analysis, forty-three polymers have been carefully researched and selected based on their variety of erosion yields (volume of a polymer lost per incident oxygen atom), to be tested through exposure to AO in the actual space environment. Novel laboratory techniques have been developed to quantify AO erosion for these polymers through two distinct methods: mass loss measurement, and recession depth measurement using salt or mica particles. Extensive pre-flight analysis of the polymers has been completed so that post-flight comparisons can be made down to the atomic level. Toward this goal, each sample has been tested for variables including identifying salt and mica particle

application techniques, and the effects of condensation on salt-sprayed samples have been researched for every polymer through experimentation. These studies are relevant to determining erosion yields using the recession depth technique, as both salt and mica protect a surface from AO erosion. Also characterized was the hygroscopic nature of each polymer, which is relevant to determining erosion yield using the mass loss technique; rehydration curves for thirty-six of the polymers have been conducted, and to record the pattern and extent to which the polymers gain moisture has been determined. Toward the necessity of evaluating each polymer's density for post-flight mass loss analysis, ten density columns have been completed to determine the densities of thirty-three polymers. Toward our initial goal of analyzing polymers that were exposed to the actual space environment, one set of the 43 polymers is currently attached to the International Space Station (ISS); the samples will return for analysis aboard STS-114. Although we are not able to quantitatively analyze the polymers' erosion until the samples return from exposure, photographs of the experiment from subsequent shuttle missions qualitatively reveal that the polymers have already been visibly eroded.

BOARD 08 IDENTIFICATION OF FLUOROQUINOLONE RESISTANCE PROTEINS IN STAPHYLOCOCCUS AUREUS. **ZACHARY T. TACKETT ZACHTACKETT85@AOL.COM, 9604 ST RT 7, PROCTORVILLE OH (FAIRLAND HIGH SCHOOL)**

As a result of the liberal use of fluoroquinolones in the treatment of bacterial infections, many strains of *Staphylococcus aureus* have acquired resistance to fluoroquinolones. In order to identify fluoroquinolone resistance proteins, initial cultures of *Staphylococcus aureus* were grown on tryptic soy agar (TSA) and exposed to 5 ¼g of ciprofloxacin by the disc diffusion method. This was repeated until the cultures were proven resistant as determined by one-way ANOVA with ± = 0.05; proteins were then extracted from the initial and resistant cultures for SDS-PAGE. The molecular weights of the dynamic proteins were determined using standards, and the protein changes were then cut out of the gel and prepared for matrix-assisted laser desorption-ionization time of flight mass spectrometry (MALDI-TOF MS). The MALDI-TOF MS results were successful at identifying two proteins: an endo-1,4-^{2}-gluconase homolog (BAB95553) and a hypothetical protein (BAB96202). As of now, the function of this hypothetical protein has not been experimentally determined; however, because of sequence homology with many known resistance proteins, the results of this experiment indicate that it may play a role in fluoroquinolone resistance. Endo-1,4-^{2}-gluconase provides ATP, which enables the cell to survive in a stressful environment. This study indicates that fluoroquinolone resistance may be caused by a pump, which would require the cell to use additional energy. These conclusions will be useful in producing an antibody to suppress fluoroquinoline resistance proteins.

BOARD 09 USING PLATELET AGGREGATION AS A MEASURE OF THROMBOGENICITY AND ITS RELATION TO PATIENTS' GENDER AND AGE. **VIVEK S. YEDAVALLI PHENOMV2K@HOTMAIL.COM, 6143 WIGEON CT, DUBLIN OH 43017 (VILLAGE ACADEMY)**

Recently, the use of Nitinol stents in cardiovascular surgical procedures has gained wide popularity. In a surgical procedure, a thin stent is placed in a narrowed artery where it expands and dilates the artery. Obviously along with this use, questions have been raised as to the biocompatibility of Nitinol in these clinical applications. In particular, the issue of thrombogenicity has been addressed in this context. Towards this objective, it was proposed to use platelet aggregation as a measure of thrombogenicity. For this it is important to first understand the platelet aggregation characteristics without any foreign substance (such as a Nitinol stent) and after these characteristics are analyzed thoroughly, the effect of Nitinol stent's presence on these characteristics can be analyzed at a later stage. Thus the emphasis in this research project was to analyze the platelet aggregation characteristics as a function of patients' gender and age. The platelet aggregation is calculated as a percentage value normalized to a given amount of platelet count in a given volume of blood sample. It was hypothesized that the platelet aggregation is more for older patients (above 50 years of age) and that this phenomenon is more pronounced in females than in males. With a list of 60 patients' platelet counts supplied by the Laboratory of Dr. Glen Cooke of the Ohio State University Heart and Lung Research Institute, where the platelet count was determined by an experimental procedure followed in the laboratory with the assistance of laboratory personnel, the data was analyzed to test these hypotheses. From this analysis, it is concluded that the first hypothesis is correct in the sense that patients above 50 years of age have more platelet aggregation percentages but the second hypothesis turned out to be incorrect because older males have significantly higher aggregation percentages than younger males whereas the females did not show that much variation as a function of age. This research thus demonstrates that platelet aggregation is indeed an important measure to be used in understanding the thrombogenecity in cardiovascular surgeries and that patients' gender and age do play an important role in these surgical procedures involving blood/material interaction.

BOARD 10 WILL THE SURFACTANT, POLOXAMER 407 AID IN UTILIZATION OF *ALLIUM SATIVUM L.* AS AN ANTISEPTIC IN GROUND BEEF HAMBURGERS? **AMY C. SCHLEGEL DSCHLEGEL@COSHOCTON.COM, 1900 ATWOOD TERRACE, COSHOCTON OH 43812**

It was hypothesized that an *Allium sativum L.* solution would decrease the bacterial growth represented by the total plate counts of heterotrophic mesophilic bacteria in colony forming units on a trypticase soy agar plate in all tested hamburger samples. *Allium sativum L.* with Poloxamer 407 would have the greatest effect on the decrease of bacterial growth. Hamburger samples from Burger King and Wendy's fast food restaurants, and Big Bear Raw Ground Beef Chuck in Coshocton, Ohio, were tested using *Allium sativum L.* and the surfactant Poloxamer 407 (found in most commercially available mouth rinses). Twenty percent solutions were made using the surfactant Poloxamer 407 and in the five trials, either alcohol (trials 1-4) or water (trial 5) was used. Then Kyolic Liquid Aged Garlic Extract was added to the Poloxamer 407 solution in portion in a separate container. Hamburgers were diluted and tested plain, with Banicide, with garlic, with a Poloxamer 407 solution, and with a combination Poloxamer 407 and Garlic solution. All solutions were mixed in a 1:1 ratio, then left to sit for 45 minutes (time protocol for Banicide). All samples were plated on trypticase soy agar plates, maintained at a 27 C° environment, and read at 24, 48, 72, and 96 hours. The results were that garlic did not decrease bacterial growth, but rather increased growth; and that the garlic and Poloxamer 407 solution did decrease growth.

BOARD 11 DOES PRICE DETERMINE THE PURITY OF WATER? **MICHAEL A. SEARS PSEARS@ASHLAND.EDU, PO BOX 998, ASHLAND OH 44805 (ST. EDWARD SCHOOL)**

Why do people pay for bottled water when they can get tap water for free, and why do people pay more for some bottled waters than for others? Are they paying for purity? The hypothesis suggested by these questions is that more expensive water is purer (as measured by the absence of bacteria). Testing the hypothesis required the use of the biology lab at Ashland University under the direction of Dr. Glenn White. Materials used in the experiment included: 1) five different brands of bottled water purchased at local supermarkets, Ashland city tap water, and ultra pure lab water; 2) double-strength (2x) nutrient broth to stimulate and support bacterial growth; 3) 43 fitted-top and screw-top sterilized test tubes; 4) nine sterilized pipettes and an automatic pipetter; and 5) a New Brunswick Controlled Environment Incubator. Three samples from each type of water were mixed with nutrient broth in sterilized test tubes using the automatic pipetter and then incubated and tested for bacteria using a double-blind experimental procedure. In addition, positive and negative control samples were utilized. The first experiment yielded one positive result for bacterial growth (Absopure Natural Fluoride Artesian Drinking Water). Two additional experiments with different samples of this water confirmed that Absopure Natural Fluoride Artesian Drinking Water contains bacteria and the results were not due to experimenter error or unsterile technique. Since this water was one of the two lowest-cost bottled waters tested, the hypothesis was partially confirmed: more expensive bottled waters were pure (but free tap water is equally as pure). I wrote the company informing them of these potentially troubling results. Mr. Glen Davis, Quality Assurance Manager at Absopure Water Company, responded that natural bottled drinking water typically contains naturally-occurring, non-pathogenic bacteria, or *flora.*

BOARD 12 THE MYSTERY OF MISSING MATTER IN THE UNIVERSE: THE SEARCH FOR WIMPS (WEAKLY INTERACTING MASSIVE PARTICLES). **KATHARINE G. TROSTEL KTROSTEL05@HB.EDU, CAITLIN A. FOGARTY, 19600 N PARK BLVD, SHAKER HEIGHTS OH 44122 (HATHAWAY BROWN SCHOOL)**

The composition of the universe remains a mystery due to the problem of missing mass. It is known that clusters of stars constitute 30 percent of the total mass of the universe. However, baryonic matter only makes up 5 percent of the total mass of the universe. Thus, it is apparent that 25 percent of the matter in clusters has not been identified. Exotic dark matter may account for this discrepancy. Our study focused on a specific type of cold dark matter called WIMPs, or weakly interacting massive particles, because they can account for some structure formation. Currently, two studies are being performed to find evidence of the existence of WIMPs. DAMA, or Dark Matter Search, claims to have detected WIMPs, while CDMS, (The Cryogenic Dark Matter Search), does not support this claim. This study aimed to examine this discrepancy by fitting DAMA's data to three halo models, varying in their velocity dispersions, to either confirm or rule out one of these models. We accomplished this using least squares fitting, and then examined how the data's limit plots behaved for each model in comparison to the standard model. As a result, we found that these halo models were not sufficient in making the two experiments agree, and were able to rule them out as possible solutions to the problem.

BOARD 13 A THEORETICAL APPROACH TO THE OPTIMAL LENGTH OF A MUSICAL SCALE. ELENA UDOVINA LENA_U_1999@YAHOO.COM, VITALY BERGELSON VITALY@MATH.OHIO-STATE.EDU, 5870 BRIARHILL DR, SOLON OH 44139 (HATHAWAY BROWN SCHOOL)

It is a well-known problem in music theory that the 12-tone scale used in Western music today is not acoustically ideal; that is, the intervals that can be played in it only approximate acoustic consonance. Two natural questions, therefore, arise: why was 12 chosen for the length of the scale, and is it the ideal length? An order of consonance was assigned on the musical intervals, which was shown mathematically sound and consistent with previous studies. Octave equivalence was assumed for the purposes of a purely mathematical investigation. Only well-tempered scales with equal intervals between subsequent notes and a finite number of notes inside one octave were analyzed, the accepted approximation in mathematical studies in the field. Several definitions of a best scale were introduced that involved different techniques of evaluating the cumulative error of each scale relative to its length, and scales of length up to 150 tones were compared using C++ and Microsoft® Excel under the definitions established. The first 100 consonant intervals (as defined by the order of consonance established) were used in the computer approximation; while the number is less than infinite, other studies usually consider no more than 10 intervals. The results suggest that in the era of computer-generated sound when large lengths of scales are becoming more viable, the scale of lengh 53 is the best for accompaniment of voice.

BOARD 14 RECYCLED RESIN PLASTICS CAN IMPROVE PLANT GROWTH WHILE REDUCING ENVIRONMENTAL WASTE. ALICIA D. BOYKIN ABSOC16@AOL.COM, 3383 FAULKNER DR, BRUNSWICK OH 44212 (WALSH JESUIT HIGH SCHOOL)

Plastics are important to society. Many household products, packaging and consumer products are made of plastics. Society uses resin plastics faster than they can decompose. This project investigates a way to recycle resin plastics by pulverizing the plastics and using them as a soil supplement. Six different types of resin plastics were pulverized and used in this experiment: Polyethylene Terephthalate, (PETE), High Density Polyethylene, (HDPE), Vinyl, (V), Low Density Polyethylene, (LDPE), Polypropylene, (PP), and Polystyrene, (PS). The resin plastics were obtained from everyday items, such as a soda bottle or a grocery bag. Soybeans, corn and string beans were the plants tested in this experiment because they are some of Ohio's main crops. The plants were grown from November 2001 – March 2002. It is hypothesized that pulverized resin plastics will reduce environmental waste and improve plant growth. Each plant was grown separately with each type of resin plastic. A layer of the pulverized plastics covered the seeds, and more soil was placed over the plastic layer. Each test was run twice and compared to the control. The pH level of the soil was tested to ensure that the plastics did not affect the pH level of the soil. The amount of water in the soil was also tested to determine if the pulverized resin plastics helped trap water in the soil. The height of each plant was taken and compared to its control. Pulverizing resin plastics will reduce its volume and primarily reduce the amount of space it would occupy, thus reducing environmental waste. The pulverized plastics also aided in the growth of the plants. All string bean and soybean plants with pulverized plastics in their soil grew taller than their controls. Plastic PETE aided best in the growth of the string bean and soybean plants. This pulverized plastic kept the most amount of water in the soil. The results show that plants with more water stored in the soil by the plastics, grew the tallest in the time provided. Pulverized plastics in the soil increase the process of string bean and soybean growth, which may ultimately benefits farmers and the consumer of these products.

BOARD 15 A COMPARATIVE STUDY OF DIVERSITY IN THREE FOREST ECOSYSTEMS IN NORTH EAST OHIO. ROWAN M. WEBSTER[1] FLAMESTORM2000@YAHOO.COM, MARA J. MCGARRIGLE[1], MAKELLA SLAVICK[1], AMANDA A. SMITH[1], ABE J. HAAS [1], TRISTAN T. QUIGLEY[1], FRANCESCA S. LUNARDI[1], LIZ LOCKEMER[1], SAMUEL D. MARSHALL[2] MARSHALLSD@HIRAM.EDU, AND RACHEL MCKINNEY[1], [1]HERSHEY MONTESSORI FARM SCHOOL, 11530 PROUTY RD, HUNTSBURG OH 44046, [2]J.H. BARROW FIELD STATION, HIRAM COLLEGE

We conducted an all-taxon species inventory in three forest ecosystems that differed in stand age. We studied an old-growth beech-maple forest and a 20 year old maple forest at the J.H. Barrow Field Station, Hiram Township, Portage Co. and a 60 year maple forest at Hershey Montessori Farm School, Huntsburg, Geauga Co. We created nine randomly placed 5 by 5 meters plots, with three replicate plots in each forest. The studies were conducted between 23 September 2002 and 4 November 2002. At each visit, we would visually examine the plots for any vertebrates, invertebrates, or fruiting fungi. We randomly sampled for herbaceous plants using three replicate one-meter square quadrats in each plots. To sample forest-floor invertebrates we set up three replicate pitfall traps in each plot. To sample the leaf-litter community we took three 573.0 cm^2 replicate leaf litter samples per plot, and used a Berlese funnel to extract all invertebrates. We conducted point count surveys for birds in the Hiram plots. This consisted of four individuals scanning the forest in and around each plot for 10 minutes on the 30th of September. We identified and measured the DBH of all the trees in our plots. We also identified and counted all standing woody vegetation taller than breast height and < 3 cm dbh. Preliminary analyses indicate that the old-growth forest at the J. H. Barrow Field Station has the highest species richness over all.

BOARD 16 EFFECTS OF NUTRIENT LOADING ON SEEDLING GROWTH. ALEX DLUGOSS ADLUGOSS@HOTMAIL.COM AND ZACK SLOCUM, 9415 LANGDON LANE, NORTH ROYALTON OH 44133 (CUYAHOGA VALLEY CAREER CENTER)

Growth of sweet corn seedlings was tested comparing nitrogen, phosphorus, and potassium treated plants. Each nutrient affects different aspects of plant physiology. Nitrogen encourages green and vegetative growth. Potassium promotes healthy root growth and increases chlorophyll production. Phosphorus encourages production of seeds, production of fruit, and root formation. It was hypothesized that nitrogen treated plants would have the best overall growth because nitrogen encourages vegetative growth. The sweet corn seedlings were transplanted into sixty pots (each containing 98.0 grams of soil) and were randomly arranged. Four sets of fifteen pots were treated with a 300ml nitrogen solution (0.075 grams of Urea). This procedure was repeated for phosphorus (0.150 grams of Phosphate), potassium (0.425 grams of Potassium Chloride) and a control (300ml of tap water). The data showed that sweet corn treated with nitrogen (mean height = 28.2cm, standard deviation = 3.86cm) grew taller than the control treatment (mean height =23.3cm, standard deviation = 2.3 cm). A t-test comparing growth between the control group and the nitrogen-treated group was significant ($p<.05$). The results support the hypothesis that nitrogen encourages more rapid vegetative growth than a non-treated solution.

BOARD 17 THE EFFECTS OF EARLY TRANSPLANTATION ON PLANT GROWTH. THOMAS FITZGERALD E2EMAINTENANCE@AOL.COM, JASON MARTIN, 161 NORTHFIELD AVE, NORTHFIELD OH 44067 (CUYAHOGA VALLEY CAREER CENTER)

Most literature concerning transplanting states that seedlings should not be transplanted before true leaf establishment. Plant growth was observed for effects of early transplantation (before true leaf establishment). Beans were transplanted either before or after the establishment of true leaves. A control group was not transplanted. Plants transplanted before true leaf establishment were hypothesized to have stunted or lower growth rates compared to those that were transplanted after the establishment of true leaves. Three groups of twelve bean plants were placed into flat trays for the procedure. The experiment was conducted in a greenhouse. The bean seeds were planted at a depth of two centimeters in sixteen grams of soil. The plants were placed under a mist system and rotated each day to ensure equal watering. The average greenhouse temperature during the procedure was twenty-one degrees Celsius. The plants were observed for three weeks. Bean plants transplanted before true leaf establishment grew less (mean = 12.7 cm, standard deviation = 3.6 cm) than those that were transplanted after the first seed leaves opened (mean = 15.1 cm, standard deviation = 1.6 cm). A t-test was conducted comparing the results from the two experimental groups. The difference in growth between the groups was statistically significant ($p < .05$). These results support the hypothesis that transplantation before establishment of true leaves is detrimental to plant growth.

BOARD 18 AH...THAT IS BETTER. CHAD W. KOENIG GWK@TDS.NET, 5692 RD.16-C, CONTINENTAL OH 45831 (MILLER CITY HS)

Materials have various sound absorbing qualities. A metal test chamber measuring 8 x 12 x 27.5 was constructed to evaluate the four different materials to determine their individual acoustic ability. The four materials tested were carpet, ceiling tile, blue board, and particleboard. The amount of in air inside of this chamber is 2640 square inches. The sound levels of the presses and welding stations in a steel factory where the occupational environmental noise exposure was above eight-five decibels were recorded by using a dosimeter and a tape recorder. A tape recorder generated the known sound level in one end of the test chamber and the dosimeter determined the reduction in noise level at the opposite end of the chamber. Each material was tested for its sound absorption quality. The purpose of this project is to compare the sound absorption qualities of various insulating materials using the same thickness of each material (one half inch and one inch). It is hypothesized that the thicker and more dense the material the better sound absorption quality. The results showed that different materials absorb different amounts of noise at different thickness. Graphs were designed to show the comparison of materials. Hearing conservation by reducing noise exposure will preserve the quality of hearing for those individuals exposed to loud noises.

Reptiles and Birds
09:00 AM, Saturday, April 5, 2003
Brewer/Frost Science 108
Dr. Danny J. Ingold-Presiding

9:00 POPULATION AND DIVERSITY OF TERRESTRIAL *CAUDATA* ALONG AN ELEVATIONAL GRADIENT.

Jacqueline M. Doyle jdoyle@wooster.edu, (Vikram Iyengar viyengar@wooster.edu), College of Wooster, C-1427 1189 Beall Ave, Wooster OH 44691

Recent evidence of amphibian decline in the Southern Appalachians suggests a need for better understanding of the relationship between amphibious species and their habitats. During the summer of 2002, species of *Caudata* were surveyed within the five forest communities within Coweeta Hydrologic Laboratory in Otto, NC. It was hypothesized that salamander species diversity will differ from one forest community to another, suggesting the ecological niche that each species prefers. It was further hypothesized that salamander activity will differ with changing temperature and precipitation, suggesting microclimatic conditions that are important for individual species habitat specialization. One sampling site was established in each of five forest communities situated across an elevational gradient. Forest communities surveyed included xeric oak-pine, cove hardwood, low elevation mixed oak, high elevation mixed oak and northern hardwoods. Each site was divided into a 5-plot by 5-plot grid, with each plot containing two cover-boards. Salamanders found under cover-boards were identified and measured every two weeks from mid-June to October. Precipitation, air temperature and soil temperature data for each site were measured by microclimate stations. Initial observations include the following species of salamanders: 18 *Plethodon glutinosus* within all forest communities and at all elevations, 4 *Eurycea wilderae* at the two lowest elevations, 71 *Plethodon jordani* at the two highest elevations, and 8 *Desmognathus ocrophaeus* only at the highest elevation.

9:15 EFFECTS OF SOIL TYPE AND MOISTURE ON THE BODY MASS AND TIMING OF THE EASTERN BOX TURTLE'S (TERRAPENE CAROLINA) EMERGENCE FROM HIBERNATION.

Guinevere L. Reilly, (Teresa A. Johnson tjohnson2@wooster.edu), College of Wooster, 1189 Beall Ave, Wooster OH 44691

Understanding the seasonal activity patterns of an animal is essential to aiding in its preservation. For reptiles, particularly those that dwell in temperate zones and are thus exposed to harsh winter conditions, this involves functional knowledge concerning all aspects of their winter dormancy or hibernation. Influences of substrate type and moisture have been examined with regard to turtle survival during hibernation at low temperatures. However, the impact of these environmental factors on hibernation emergence has not been studied. The timing of renewed activity affects the turtle's ability to reestablish a normal body weight due to food availability and weather conditions. Two different types of soil will be utilized in this experiment, one treatment consisting of solely of the Ohio Killbuck series Ap and Bg1 while the second treatment will consist of a half-and-half mixture of the Killbuck series and sand. Each soil type will be maintained at two different moisture contents of 30% and 80%, thus creating a total of four separate testing environments. Thirty-two adult male Eastern Box turtles will be randomly, but evenly, distributed amongst these four environments and, after a period of cold acclimation, they will be placed within a human created hibernaculum (i.e., den) of predetermined substrate type. These dens will be held at 4°C for three weeks, after which a heat source will be applied to the surface of the soil. Records will be kept as to the soil temperature, turtle internal temperature and turtle weight throughout the duration of the hibernation period. Records concerning the time interval between the application of a heat source and increased turtle activity will also be kept. It is hoped that our findings will indicate that soil type and moisture content have a significant bearing on the time at which the box turtles emerge from hibernation.

9:30 PHYLOGEOGRAPHY OF THE FRECKLED PYTHON (LIASIS MACKLOTI) OF INDONESIA'S LESSER SUNDAS ARCHIPELAGO BASED ON MULTIPLE CHARACTER ANALYSES.

Christopher K. Carmichael ccarmichael@malone.edu, Malone College, Dept of Natural Sciences, 515 25th St NW, Canton OH 44709-3897, Brian R. Kreiser Brian Kreiser@usm.edu, University of Southern Mississippi and David G. Barker vpi@beecreek.net, Vida Preciosa International

Since Darwin's time, insular populations have played an important role in our understanding of the nature of variation. Empirical studies of natural populations are benefited by a simplified population structure generally observed on islands with reduced or no migration between adjacent islands. These natural coincidences have allowed critical insights into our understanding of the biological processes that influence patterns of geographic variation. Our main goal was to elucidate the geographic patterns of genetic, morphological and behavioral variation in a large predator, the freckled python (*L. mackloti*) of Indonesia, in order to gain a thorough understanding of the historic vicariant events that have shaped the evolution of this subspecies (and likely, species) complex. Currently, five known insular populations of *L. mackloti* have been identified in the Lesser Sundas Islands of Indonesia. Partial and complete nucleotide sequences (N=15, three from each island population) for the mitochondrial DNA (*mtDNA*) *cytochrome b* gene for each known population of *L. mackloti* were obtained and used to generate a genetically-based phylogenetic hypothesis of this potential species complex. A phylogenetic tree based on morphological characters (using scale counts collected from three individuals originating from each of the five populations; N=15) was also determined so that derived or ancestral characters could be mapped onto the gene tree. Lastly, behavioral patterns (e.g., presence or absence of male-male combat, courtship, ability to discriminate between intra and interpopulational pheromone trails) were observed (N=30), statistically analyzed, and parsimoniously mapped onto the genetically- and morphologically-determined phylogenetic hypotheses. These characters were compared to see if there were significant between-data-set incongruencies prior to presenting a final and resolved phylogenetic analyses. Results indicate that morphological, behavioral, and genetic characters are congruent and yield three well-supported clades that provide substantial evidence for recognizing each clade as a new species.

9:45 THE EVOLUTIONARY RELATIONSHIPS OF CHARDRIIFORMES (SHOREBIRDS) BASED ON OSTEOLOGICAL CHARACTERS.

Eric J. Pilko epilko@wooster.edu, 1189 Beall Ave, College of Wooster, Box C-2500, Wooster OH 44691 and Gareth J. Dyke gareth.dyke@ucd.ie, University College Dublin, Ireland

The placement of species into genera and families based on anatomical (including bone, muscle, and feather features) and molecular characters are well documented in the avian order Charadriiformes (shorebirds). However, the phylogenetic relationship among these families has not been clearly established. Traditionally, Charadriiformes have been divided into three suborders: Charadrii, Lari, and Alcae. In a 1978 phylogenetic study on Chardriiform osteology, Strauch used compatibility analysis on specimens from over 20 collections worldwide and reorganized the Charadriiformes into the following three suborders: Alcae, Scalopaci, and Chardrii. Strauch's use of the outdated method of compatibility analysis, along with his vague determination of character polarity, indicates the need for a revision of his work. The aim of this study is to reevaluate Strauch's work by revising and adding to his codings and collecting new data. Some 89 osteological characters were coded for 56 specimens (56 species) of birds spanning 13 families. The data were collected in June of 2002 using the ornithology collection at the American Museum of Natural History in New York. These revised data have been analyzed using the method of parsimony on the software program PAUP. Our results disagree with Strauch and support the more traditional breakdown of the Charadriiformes. However, instead of three suborders, the Chardriiformes can be broken down into two: Lari (which includes Alcae) and Chardrii (which includes Scalopaci). In both cases, the included group forms a monophyletic subgroup of the larger suborder.

10:00 EFFECTS OF EASTERN WILD TURKEY (*MELEAGRIS GALLOPAVO SILVESTRIS*) SCRATCHES ON HARDWOOD REGENERATION IN TWO SOUTHEASTERN OHIO FORESTS.

Zachary L. Rinkes zacharyrinkes@hotmail.com and Brian C. McCarthy mccarthy@ohio.edu, Dept of Environmental and Plant Biology, Ohio University, Athens OH 45701

Scratches by the wild turkey have the ability to impact seed germination in the forest understory by removing the leaf litter layer. This litter mat plays an important role with respect to impedance, light availability, and water availability- all important factors for successful forest regeneration. The primary objective of this study was to aid foresters and wildlife managers by examining the impacts that turkey scratches may have on seed germination at two forests in southeastern Ohio (Raccoon Ecological Management Area (REMA) and Zaleski State Forest). These forests have heterogeneous forest floor conditions due to various management regimes (Burned, Thinned/Burned, Thinned, and Undisturbed). Exclosures (*N=8*) were erected in each unit and contained a litter removal treatment (scratched) and control (non-scratched) plot. Seeds of *Quercus alba*, *Q. velutina*, *Fagus grandifolia*, and *Acer rubrum* were planted into each plot. A 4-way ANOVA detected no significant ($P > 0.30$) difference in germination between sites or among silvicultural units, but a significant difference was found among species ($P < 0.01$) and species × treatment interaction ($P < 0.01$). *Q. alba*, *Q. velutina, and F. grandifolia* had better germination success ($P < 0.05$) in the unscratched plots, while *A. rubrum* did not respond to the scratching treatment. The nut species may require a microenvironment with adequate litter to promote optimal germination.

10:15 NEST-SITE FIDELITY IN GRASSLAND NESTING BIRDS ON A RECLAIMED STRIPMINE IN EAST-CENTRAL OHIO.

Danny J. Ingold Ingold@muskingum.edu, **Biology Dept., Muskingum College, New Concord, OH 43762, Charlotte Worshtall** cworstall@hotmail.com, **Rick Yost** ryost@muskingum.edu

One measure of the long-term usefulness of reclaimed stripmines for breeding grassland birds is the extent to which individuals return to previous nest sites during consecutive years. During May through July of 2000-2002, we set out to determine the frequency with which three grassland sparrow species and bobolinks (*Dolichonyx oryzivorus*) return to nest on previous nest sites on a reclaimed stripmine (The Wilds). During each season, birds were captured in mist nests, fitted with a unique combination of plastic color bands and released. In 2001 and 2002 we searched our study plots for birds banded during previous years. Sixteen of 47 grasshopper sparrows (*Ammodramus savannarum*) (34%) were recaptured (or resighted) in subsequent years in the same 100 m x 200 m plot in which they were banded, while 9 of 41 savannah sparrows (*Passerculus sandwichensis*) (22%) were recaptured. Only 1 of 26 (3.9%) Henslow's sparrows (*A. henslowii*) and 2 of 7 (29%) bobolinks were recaptured in subsequent years. Significantly more male grasshopper sparrows returned versus females of this species ($\S^2 = 5.38$, df = 1, $P < 0.05$). The frequency with which birds returned to plots that had been mowed in April of each year did not differ from the return rate of birds to unmowed plots. Three of 48 birds banded in 2000 (6%) (2 grasshopper and 1 savannah sparrow) returned to the same plot in which they were banded for two consecutive years. These data suggest that grasshopper and savannah sparrows are strongly nest-site tenacious on this reclaimed mine. The data further suggest that these species are having some reproductive success on this artificially created grassland.

10:30 FACTORS INFLUENCING BIRD MORTALITY FROM AUTOMOBILES NEAR WOOSTER, OHIO.

Crissa K. Cooey ccooey@wooster.edu, **(Marilyn D. Loveless** mloveless@wooster.edu**), College of Wooster, C-1311, 1189 Beall Ave, Wooster OH 44691**

Cars are lethal towards animals. Researchers found that raccoon population number estimates could be determined by the number of raccoon road casualties detected in a designated area (Rolley and Lehman, 1992). Jones (2000) determined whether Tasmanian devil populations were in trouble due to road casualties. Bird road casualties were examined on roads surrounding Wooster, Ohio. Types of roads, road characteristics and bird migration trends were compared to see if they influenced bird road death. Road types and characteristics were predicted to influence bird death. Each week of the migration season was predicted to yield different numbers of bird deaths. The study took place between September and December of 2002. Four road types (interstates, main, less traveled and back roads) were examined. Three roads of each category were observed for a total of 12 roads. Once a week, each road was surveyed for ten miles. When a dead bird was found on the road, the species, age (juvenile/adult), and gender (from plumage) were determined. Road characteristics such as speed limit, road width, shoulder width on both sides, lane (north, south, east, or west bound), and surrounding habitats were recorded. No significant difference was found between road type versus the total number of birds detected (ANOVA r2 = 0.038; P value = 0.954). Significant differences were found between the week of the migration season versus the number of birds detected for interstates (ANOVA r2 = 0.626; P value = 0.0029) and main roads (ANOVA r2 = 0.625; P value = 0.0029).

Insects and Environmental
02:00 PM, Saturday, April 5, 2003
Brewer/Frost Science 108
Prof Michael T. Homsher-Presiding

2:00 RESPONSE OF MALE *HELICOVERPA ARMIGERA* (LEPIDOPTERA: NOCTUIDAE) TO A FEMALE SEX PHEROMONE SOURCE: FLIGHT PATTERN, PEAK MOTH ACTIVITY AND EFFECT OF WEATHER PARAMETERS ON THE TRAP CATCHES.

Lakshmipathi Srigiriraju srigirirajul@findlay.edu, **University of Findlay, 1000 N Main St, Dept of Environmental Management, Findlay OH 45840-3695**

Insect sex pheromones are routinely used to attract pests to a source and trap for population monitoring. Studies were conducted at The International Crops Research Institute for the Semi-Arid Tropics, Asia Region, (ICRISAT) during 1999-2000, on the male nocturnal moth, *Helicoverpa armigera*, to examine the trapping effectiveness of the "ICRISAT Dry Funnel" pheromone trap design. Previous studies had only compared the yields from different trap designs, not the flight behavior of a male moth to a female pheromone source and how it impacts the effectiveness of the trap. The number of moths trapped per hour assumed a skewed distribution, with a steady increase through the night, recording a slight peak at around midnight (8.7% of the total moth catch; 8.7 ± 1.3 moths) and a more prominent peak (56.2% of the total catch; 56.2 ± 3.9 moths) around 3 AM. The moths (n = 450) approached the traps about 1.5 times per minute and were trapped at rate of 0.32 per minute. This trapping rate is considered low for reliable pest monitoring. Moth flight behavior near the pheromone source was systematically described to help guide improvements to trap design. Near the pheromone source, flight oscillations increased, with short downwind exploratory movements, and well-defined zigzagging in a vertical plane took place before leaving the source and escaping the trap in a gentle downwind climb. Meteorological factors such as fluctuations in temperature, relative humidity and wind velocity also appeared to impact trapping effectiveness, but were not varied enough to produce any marked activity thresholds.

2:15 THE DIVERSITY OF NATIVE BEE (APOIDEA) COMMUNITIES IN THE ADIRONDACK MOUNTAINS IN BOGS AND IN RELATION TO ELEVATION AND SUCCESSION.

David A. Powell, (Lyn Loveless mloveless@wooster.edu**, College of Wooster, and William L. Romey** romeywl@mail.potsdam.edu**, SUNY-Potsdam), College of Wooster, Box C-2522 1189 Beall Ave., Wooster OH 44691**

Despite their significance as pollinators, native bee (non-honey bees) communities are known to be declining in abundance and diversity. A deeper knowledge of the baseline diversity and ecology of native bees would provide greater insight into the causes of their decline and aid the development conservation methods. This project attempted to address this goal with three ecological studies on the diversity of bees in the Adirondack Mountains of New York State over the summer of 2002. Pan traps were used to collect bees in all three studies and floral surveys of the sampling sites were conducted using meter quadrants at every sample time. Close to 1,000 individual bees were collected, belonging to sixteen genera. The first study examined the relationship between elevation and bee communities. We hypothesized that elevation would have an inverse relationship with the diversity of bee communities. However, our results showed a peak in bee diversity at the mid-elevation (3500 ft.) of five elevations, each sampled seven times. A second study examined the diversity of bees in three bogs in the Adirondacks over five sampling days. A unique habitat, bogs are home to a variety of flowering plants, such as blueberries, that may have specialized pollinators not found elsewhere in this area. We predicted the diversity of bee genera in bogs would vary from other study sites. The last study compares bee diversity between four logging sites, each representative of a separate stage of succession, sampled five times over the summer. We predicted that more open sites would support a higher diversity of native bees due to more abundant floral resources. All three of these studies should enhance the understanding of how habitats affect the diversity of bee communities.

2:30 ATTRACTION OF MULTICOLORED ASIAN LADY BEETLES, *HARMONIA AXYRIDIS,* TO EXTRAFLORAL NECTARIES OF MUNG BEANS.

Mark E. Headings headings.1@osu.edu, **Roger N. Williams**[1] williams.14@osu.edu, **Ohio State University Agricultural Technical Institute, 1328 Dover Rd, Wooster OH 44691 and OSU Ohio Agricultural Research and Development Center**

The multicolored Asian lady beetle, *Harmonia axyridis,* is a non-native beneficial insect in agriculture, which has become an increasingly widespread nuisance in the continental United States. It feeds extensively on aphids; however, the growing concern is the prevalence of this insect, sometimes in very large numbers during colder months of the year, in the homes of people. The objective of this study was to investigate the culture of mung beans under Ohio growing conditions and insects associated with the plant. Field research was conducted on six rows, 16.15 m in length, near Wooster, Ohio. The multicolored Asian lady beetle was one of the insect species commonly observed on mung beans, during late summer, 2002. Upon closer examination, these beetles were observed feeding on nectar from extrafloral nectaries located near the distal end of stems between pairs of flowers. A scanning electron microscope was used in preparing 33 photographs of the nectaries. Each nectary is distinctly raised and has one to five openings in slightly depressed areas from which the nectar exudes. A flowering stem commonly has one to three nectaries on each of two sides of the stem; however, up to seven have been observed. Wasps, ants, and flies also frequently visited the nectaries. In summary, mung beans were found to have extrafloral nectaries which are attractive food sources for multicolored Asian lady beetles plus several other insect species. Further investigations into the importance of these extrafloral nectaries for plant pollination and crop yields are warranted.

2:45 URBAN SOIL MANAGEMENT AND ITS EFFECTS ON INSECT HERBIVORY.

Joseph H. LaForest laforest.1@osu.edu, Daniel A. Herms, Pierluigi Bonello, Depts of Entomology and Plant Pathology, Ohio State University, 201 Kottman Hall, 2021 Coffey Rd, Columbus OH 43210

Because urban soils are often degraded by construction activities, fertilizer and mulch are commonly applied to improve the soil and stimulate tree growth. Two competing hypotheses address the effect of these management practices on plant defense to herbivores. The first states that nutrient stressed trees are more susceptible to herbivores because stress weakens plant defenses, and predicts that fertilization will reduce herbivory by increasing tree vigor. The other proposes that because of an allocation trade off between growth and defense, fertilized trees will grow faster, but at the expense of decreased herbivore resistance. In 2001-02, we conducted a field study in Wooster, OH to determine the effects of 3 treatments: 1) fertilization; 2) mulching with composted yard waste; and 3) composted hardwood bark blended with composted manure on tree growth, defense chemistry (total phenolics), and insect resistance of *Betula papyrifera* (paper birch) planted in either topsoil or subsoil. 48 trees were placed in 1 m^3 of either topsoil or subsoil plots lined with heavy plastic. The 24 trees in each soil type were assigned to one of the 3 treatments or the bare soil control. The six replicates were divided evenly between 2 blocks. Mulches were applied to a depth of 2 inches. Fertilizer was applied at a 200 kg/ha/yr, with 175 kg N from 30-10-7 and 25 kg N from 34-0-0. 58.63% of the N applied was in a slow release form. To assess treatment effects on insect resistance, we conducted bioassays with gypsy moth [*Lymantria dispar*], forest tent caterpillar [*Malacosoma disstria* (Hübner)], whitemarked tussock moth [*Orgyia leucostigma* (J.E. Smith)], yellow-necked caterpillar [*Datana ministra* (Drury)] and fall webworm [*Hyphantria cunea* (Drury)]. Trees in topsoil grew faster than those in subsoil regardless of soil treatment, but were generally less resistant to insects as indicated by higher larval growth rates. Fertilization of subsoil plots increased the growth of some insect species to levels observed on trees in topsoil. Fertilization of trees also decreased the total phenolic content of the leaves. These results are consistent with the hypothesis that faster growing trees are less resistant to insects, and that fertilization can shift allocation of resources from defense to growth.

3:00 SYSTEMIC INDUCTION OF DEFENSE RESPONSES IN THE AUSTRIAN PINE, *SPHAEROPSIS SAPINEA* AND *NEODIPRION SERTIFER* INTERACTION.

Rui Ma[1] ma.115@osu.edu, Pierluigi Bonello[1] bonello.2@osu.edu, Dan Herms[2] herms.2@osu.edu, Don Cipollini[3] don.cipollini@wright.edu, [1]Ohio State University, Dept of Plant Pathology, Columbus OH 43210, [2]Dept of Entomology, and [3]Wright State University

Conifers play key roles in ecosystem structure and function in the world, but pathogen and insects impose significant limitations on their management. Relatively little is known about the basis of disease resistance in pines and interactions among plants, pathogens, and insects. The objective of this project is to explore systemic induction of defense responses in the Austrian pine (*Pinus nigra*) - pathogenic fungus (*Sphaeropsis sapinea*) - European sawfly (*Neodiprion sertifer*) interaction. We hypothesize that *S. sapinea* and *N. sertifer* have cross-effects on the biochemistry of host defense against the pathogen and insect. In May 2002, 90 Austrian pines in OSU greenhouse were randomly induced and challenged by inoculation with *S. sapinea* and *N. sertifer*. Mechanically wounded, mechanically defoliated and untreated trees were used as controls. Needles and phloem were sampled separately. Soluble and cell-bound phenolics and lignin were extracted and quantified. Enzymes involved in defense such as peroxidase, polyphenoloxidase, chitinase, b-glucanase and protease were also quantified in the same tissue. Some secondary metabolites, such as ferulic acid, tran-4-coumaric acid, taxifolin, pinosylvin, and pinosylvin monomethyl were identified from soluble and cell-bound phenolics, but their quantification is ongoing. Pathogen challenged phloem had more lignin than unchallenged phloem. Chitinase, b-glucanase and protease were more active in pathogen challenged phloem, but not in needles. Insect challenge did not induce chitinase at all. Insect challenged plants had higher needle peroxidase than pathogen challenged or unchallenged plants. Our results show that *S. sapinea* and *N. sertifer* do trigger systemic signals to some extent in Austrian pines, leading to a trend of alterations in the expression of secondary metabolic pathways and defense enzymes that may define the resistant phenotypes.

3:15 TIME-INTEGRATED CHEMICAL MIXTURE MONITORING MONITORING IN AN AQUATIC ECOSYSTEM WITH SEMIPERMEABLE MEMBRANE DEVICES AND WITH *DREISSENA POLYMORPHA*.

M.T.Homsher homsher@findlay.edu, University of Findlay, Dept of Environmental Safety and Occupational Health , 1000 N Main St, Findlay OH 45840, D. A. Neher, A.L Spongberg, J.F.Gottgens, University of Toledo, Dept of Earth, Ecological and Environmental Sciences, J. N. Huckins and J. D.Petty, United States Geological Service, Columbia Environmental Research Center

Traditional monitoring techniques use grab samples to characterize chemical contamination in biota, sediment, and water. However, grab samples are inadequate to detect contaminant pulses that may occur in ecosystem compartments and among samples, nor do they provide evaluative data on the impact of chemical mixtures on biota (e.g. survival, growth, reproduction). In this study reported in 2000, simultaneous exposures of Semipermeable Membrane Devices (SPMDs) and the mussel *D. polymorpha* were used to examine time-integrated concentrations of chlorinated pesticides in a diked marsh and a bay area at Winous Point, Ohio. Mussel growth, lipid content, and survival (n=685) were determined, along with sorption constants for simultaneously detected contaminants. Reductions in mussel growth and survival were associated with high total suspended solid loads and multiple contaminant detections in water at the parts per trillion level. Chlorinated pesticides were analyzed in the water, sediment, and in mussel tissue. SPMD-derived water concentrations and mussel tissue concentrations were used to calculate mussel sorption constants(K_{oc}). Experimental K_{oc} values ranged from 3.79 to 5.07. Average relative percent differences varied 14.5% from reference values. Survival and growth rates were lowest at the two sites closest to agricultural drainage. Lipid levels suggest that mussel reproduction was impaired at sites with multiple levels of contaminants. These data represents an *in-situ* multiple chemical exposure assay. Results suggest that time-integrated monitoring with SPMDs and a biomonitor provides more information about ecosystem status than chemical analysis from grab samples and also evaluates the synergistic impact of chemical mixtures to mussels.

3:30 A NEWLY DISCOVERED MUTUALISTIC ASSOCIATION BETWEEN A SPECIES OF MYCOPHAGOUS DIPTERA AND ITS BASIDIOMYCETE HOST.

Britt A. Bunyard bbunyard@ursuline.edu, Biology Dept, Dauby Science Center, Ursuline College, Pepper Pike OH 44124.

The family Platypezidae (Insecta: Diptera) is a small family (23 genera and 215 species; 71 species from 18 genera are found in North America) of Nearctic flies. Although members of this family are poorly known, it is believed that all species are mycophagous. Recent investigation by the author has found a strong association between individuals of the species *Platypeza consobrina* and members of the common macrofungus Basidiomycete genus *Agaricus*. Most species of Basidiomycete fungi that produce large basidiocarps (mushrooms) serve as hosts for many families of Diptera with mycophagous species (Mycetophilidae, Sciaridae, Drosophilidae, Chloropidae, Phoridae, Cecidomyiidae, Tipulidae, etc.). This does not seem to be the case for species in the genus *Agaricus* (e.g. *A. campestris* and *A. arvensis*). These species produce mushrooms in the spring and fall and are utilized almost exclusively by members of the Platypezidae. When examined microscopically it was determined that the larvae of platypezids feed on the lamellae (gills), including basidiospores, as well as other basidiocarp tissue. Basidiospores are retained within the gut of developing larvae, through pupation, and into the adult flies. Reared adult flies (n = 40) and wild flies (n = 22, caught during oviposition on *Agaricus* sp. basidiocarps) passed basidiospores within their feces. Passed basidiospores were identified microscopically as *A. campestris* or *A. arvensis*. Defecated spores were viable and germinated on Sabaroud-dextrose agar. These findings support the hypothesis that *P. consobrina* serves as a mutualist vector of *Agaricus* spores and would likely facilitate sexual reproduction in natural populations of this mushroom.

Aquatic Biology
09:00 AM, Saturday, April 5, 2003
Brewer/Frost Science 109
Dr. Gwynne Stoner Rife-Presiding

9:00 MODELING THE "STATE OF THE LAKE" AS AN EDUCATIONAL TOOL.

Robert A. Krebs r.krebs@csuohio.edu, and Carol A. Stepien c.stepien@csuohio.edu, Dept of Biological, Geological, and Environmental Sciences and The Center for Environmental Science, Technology and Policy, Cleveland State University, 2121 Euclid Ave SI 219, Cleveland OH 44115

Thirty years ago Lake Erie was a symbol of disaster. Today the Lake represents how the environment can be improved when government partners join across state and national borders. To understand how these changes have taken place, the Ohio Lake Erie Commission produced a State of the Lake Report in 1998 that assessed changes in the use, perception and above all the quality of Lake Erie, as summarized by a Lake Erie Quality Index. That index addressed broad areas of the nature of Lake Erie, its Water Quality, Pollution Sources,

Habitat and Biology; the index also considered Coastal Recreation, Fishing, Boating, and Beach quality; and finally, the index addressed the economic importance of the Lake to transportation and tourism. We produced an educational resource for high school and college students to teach real conflicts between humans and nature, and to help the public recognize how economic development can continue while still focusing on the sustainable preservation of Lake Erie. Furthermore, we provide a spreadsheet model that assesses how the 10 separate indices in the State of the Lake report and 28 metrics that compose them sufficiently describe the quality of Lake Erie, from improved water clarity, reduction in heavy metals, and the preservation of wetlands, while maintaining tourism, recreational access to beaches, boat docks and fishing. The full color model, available either through the WEB, www.csuohio.edu/CESTP/SOL/index.html or on a PC compatible CD ROM, enables a user to impart their preferences and goals for the biological or economic development of the Lake Erie region, and shows how different perspectives can affect decisions of how Lake Erie and its surrounding watersheds can best be improved.

9:15 NATURALLY OCCURRING LARGE WOOD REPLACEMENT IN KILLBUCK CREEK, OHIO, ONE YEAR AFTER LARGE WOOD REMOVAL.

Arthur E. L. Morris morris.591@osu.edu, **P. Charles Goebel** goebel.11@osu.edu, **Ohio State University, OARDC, School of Natural Resources, 1680 Madison Ave, Wooster OH 44691-4114**

Although large wood in rivers may increase flooding by impeding high water flow, large wood in rivers also moderates the energy of floodwaters and greatly increases animal and plant habitat diversity. In 1999, the Ohio General Assembly made available 5 million dollars for the removal of logjams and debris from Ohio rivers to decrease flood risks. A primary question underlies the advisability of such spending: how long does it take for new logjams to form? If new logjams form quickly, then the economics of removal and the impacts on stream ecology must be evaluated in light of this rapid replacement. To test the hypothesis that fewer and/or smaller logjams occurred after wood removal from a river, we georeferenced all new logjams in approximately 16 km of Killbuck Creek, a channelized river in Holmes County, Ohio, 18 months after logjams were cleared from that section of the creek in 2001. The number of new logjams we found exceeded the number recorded by Holmes County personnel in the spring of 2001. River bends, islands, and inflowing tributaries seemed to focus logjam formation. It appeared that much of the new large wood in the river was recruited from floodplain forests and tributary streams. The rapid, natural replacement of large wood in Killbuck Creek suggests that one-time removal of large wood may not be an effective management option if the objective is long-term absence of logjams in similar channelized streams. Consequently, alternative methods of flood mitigation should be considered.

9:30 LANDSCAPE CHARACTERISTICS AND THEIR INFLUENCE ON WATER QUALITY IN THE HEADWATERS OF A NORTHEAST OHIO WATERSHED.

Kathryn L. Holmes[1] holmes.203@osu.edu, P. Charles Goebel[1], Krishna Vadrevu[2], Deana Hudgins[2], Dave McCartney[2] OARDC, Ohio State University, [1]School of Natural Resources and [2]Agroecosystems Management Group, 1680 Madison Ave, Wooster OH 44691

Water quality continues to be a leading environmental concern for waterways of the United States, especially those flowing through agricultural landscapes. As watershed-scale water quality improvement plans emerge, healthy headwater systems are critical because they represent a high proportion of a stream's drainage network and have the ability to retain the majority of pollutants received. One such area is the headwaters of the Sugar Creek watershed in Wayne County, Ohio, which are severely impaired due to nutrient loading, sedimentation, and riparian habitat loss. Nutrient and sediment levels were sampled bimonthly at 21 sites throughout the headwaters watershed for one year. In order to determine and remediate possible sources of impairment, landscape characteristics including hydrologic, geomorphic, soils, and land use were analyzed to determine their influence on water quality within the headwaters of the Sugar Creek. Specifically, we used multivariate analyses (e.g., redundancy analyses) to assess the importance of each of these biophysical and social factors on water quality. Our preliminary results suggest that nitrate levels in the stream are positively correlated with the proportion of the watershed dominated by croplands, and negatively correlated with the proportion dominated by forest and pasture. Concentrations of ammonium and total solids were positively correlated with residential areas. The landscape models will be used to help target areas within the headwaters where best management practices, nutrient management plans, and habitat restoration will be most beneficial within the watershed.

9:45 AQUATIC MACROINVERTEBRATE COMMUNITIES OF THE PORTAGE RIVER WATERESHED (WOOD COUNTY, OH).

Gwynne S. Rife Rife@findlay.edu, Dwight L. Moody Moody@findlay.edu, College of the Sciences, University of Findlay, 1000 N Main St, Findlay OH 45840

Macroinvertebrate communities in a transect of the Portage River watershed were quantitatively assessed May - August 2001. The emphasis was on identification and community structure of the macroinvertebrate biota resident in its smallest order streams and ditches. Replicate (6) Hester-Dendy multi-plate samplers were used at each of 10 sites across the watershed drainage in Wood County. Samplers were collected approximately every 4 weeks. All samples were preserved, identified, and leeches, mayflies, and chironomids verified. All samples are stored at The University of Findlay Nature Center. 73 species from 11 major taxa were collected overall, with highest diversity in the smallest order tributaries. The central portion of the watershed yielded lower numbers of species and densities than the eastern or western drainage areas. Of the 10 study sites, Rader Creek and the South Branch of the Portage were the most diverse, while Bull Creek was the least diverse. The most common macroinvertebrates collected at 70% of the sites were: *Caenis sp, Stenonema femoratum, Lirceus lineatus, Physella integra*. As was predicted from the physical appearance of the majority of the sites, the Portage River watershed macroinvertebrate communities were both depauperate and trophically simplistic. Depressed and uncharacteristic communities were notable in the central portions. The impoverished state of the communities present in what is the most active time of the year for these species suggests that steps to increase the health and complexity of the habitat would offer greater natural services to the watershed and drainage.

10:00 LINK BETWEEN GEOMORPHOLOGY AND AQUATIC BIODIVERSITY IN HEADWATER AGRICULTURAL DITCHES IN OHIO.

Virginie Bouchard Bouchard.8@osu.edu and Gregg Sablak, Ohio State University, School of Natural Resources, 2021 Coffey Rd, Columbus OH 43210

Agricultural ditches are designed to maximize drainage through straightening, dredging and clearing of riparian vegetation. As a consequence aquatic habitat is destroyed, streams are disconnected from their floodplains, and flow patterns are altered. However, in absence of maintenance, the geomorphology of ditches changes over time with the establishment of a low bench structure and the development of riparian ecosystems. The objective of our research was to determine the relationship between in-stream and riparian habitat structure and biodiversity (i.e., aquatic macroinvertebrates, amphibians and plants) in headwater agricultural ditches in Northwest Ohio. Our hypothesis was that the reestablishment of floodplain connection and riparian habitats would increase biodiversity in ditches. To test our hypothesis, we sampled macroinvertebrates, amphibian and plant communities in three types of ditch reaches: (1) ditches with riparian ecosystem (e.g., ditches with tree; n = 7), (2) ditches without riparian ecosystems but with a low narrow floodplain bench (e.g., ditches with bench; n=8), and (3) ditches without riparian ecosystems and without floodplain bench (e.g., control ditches; n=7). Macroinvertebrates richness and diversity did not differ significantly among the three types of ditches. However, the ditches with bench had the highest average richness (23.3 species) and a Shannon diversity index of 1.47 while the ditches with trees had the lowest richness (16.8 species) and Shannon diversity index of 1.40. We suspect that ecosystem productivity is lower in ditches with riparian zone, as in-stream autotrophs are much less abundant due to shading by the tree canopy. We have found substrate quality to be positively correlated with macroinvertebrate richness.

10:15 INFLUENCE OF LAND USE ON STREAM HEALTH USING INVERTEBRATES AS BIOINDICATORS: A FOCUS ON BASS LAKE BASIN, GEAUGA CO., OHIO.

Leigh Hutchison lhutchison@wooster.edu, (Vikram Iyengar viyengar@wooster.edu), College of Wooster, Dept of Biology, 1189 Beall Ave, Wooster OH 44691

Invertebrate sampling has proved to be an effective, reliable, and practical form of biomonitoring and assessment of health of various aquatic environments—the invertebrates of an aquatic environment have been described as the "ecological memory" of the habitat. The objective of this study is to determine the health of seven streams managed by the Geauga Park District with a specific focus on the Chagrin River watershed and the Bass Lake Basin, Geauga Co., Ohio, using specific aquatic invertebrates as indicators of stream health. The hypothesis that streams located near disturbed land, though industry, residential development, and other anthropogenic factors, exhibit lower health than those located in relatively pristine, forested areas was assessed using Geographic Information System. Stream health and the extent of organic pollution were quantified through water quality testing of various parameters and through application of the Hilsenhoff biotic oo□index. Sampling was conducted on four streams associated with the Bass Lake Basin (Chagrin River watershed), an additional stream in the Chagrin River watershed, and three streams in the Grand River watershed in Geauga County which are not associated with Bass Lake. Each stream was sampled at three selected riffle sites using a D-shaped aquatic net to collect debris and

invertebrates disturbed by prescribed kicking and scrubbing. Chemical parameters including dissolved oxygen, pH, hardness, nitrates, phosphates, and total dissolved solids were taken for each stream. Variations in land use and the implications of these on productivity, species assemblages, and water quality will be determined.

10:30 EFFECT OF RIPARIAN FOREST FRAGMENTATION ALONG DITCHES ON RICHNESS AND BIODIVERSITY OF TERRESTRIAL INSECTS.

Aaron R. Friend friend.42@osu.edu, (Virginie Bouchard bouchard.8@osu.edu), School of Natural Resources, Ohio State University, 2021 Coffey Rd, Columbus OH 43210

Species richness and diversity are two key concepts often used in assessing ecological integrity. Intensive agricultural practices generally create homogeneous landscapes and severely reduce biodiversity. The goal of this study was to examine the effect of fragments of the forested riparian ecosystems on terrestrial invertebrate diversity and richness located along ditches within Wood County Ohio. We hypothesized that invertebrate diversity will be significantly correlated to the quantity and quality of the riparian systems. We also hypothesized that the diversity and richness of terrestrial invertebrates will be higher along segments of ditches that had riparian zones, compared to segments of ditches that did not have riparian zones. Forested and non-forested habitats located within the riparian zones of agricultural ditches were sampled using pitfall traps, made of two liter soda bottles. Five forested and five non-forested sites were sampled with three pitfall traps placed evenly within each riparian zone site. The traps were open for one week from early July to early October 2002. The traps were collected once a week for analysis and identification of the insects with field guides and identification books. Diversity was calculated using the Shannon diversity index. Data from the forested sites were compared to those from the non-forested sites using analysis of variance. Invertebrate diversity in the forested riparian sites was plotted against riparian zone area. Examining the species richness and biodiversity of riparian zones located along ditches in agricultural landscapes allowed us to determine the potential for diversity in such stressed ecological environments.

10:45 ANALYSIS OF DIATOM COMMUNITIES IN AN ACID MINE DRAINAGE IMPACTED SUBWATERSHED.

Robert G. Verb[1] r-verb@onu.edu, Morgan L. Vis[2], and Ben J. Stuart[3]. [1]Dept.of Biological Sciences, Ohio Northern University, Ada OH 45810, [2]Dept. of Environmental and Plant Biology, Ohio University, [3]Dept. of Civil and Chemical Engineering, Ohio University

Acid mine drainage (AMD) impacts numerous streams worldwide. During June of 2000, 18 stream segments located within the Black Fork subwatershed in southeastern Ohio, USA were sampled for diatom flora and critical environmental parameters. This area has a prolific history of coal mining and many of the region's lotic systems are inundated with acid mine drainage. In this region, many of the abandoned mines have been reclaimed using various techniques. The goal of this study was to determine if diatom assemblages could provide evidence of the progress and effectiveness of reclamation activities with respect to biotic integrity of aquatic systems. Through the cross-referencing of various exploratory techniques (i.e., canonical correspondence analysis) three distinct groupings of sites were depicted, each containing similar relative abundances of important diatom taxa. Group I sites were heavily impacted by AMD (low in pH) and were dominated by *Eunotia exigua*. Group II sites were moderately impacted by AMD (intermediate reclamation success) and had diatom assemblages of *Achnanthidium minutissimum*, and *Brachysira vitrea*. The third group of sites contained relatively unimpacted headwater regions in the subwatershed with diatom assemblages dominated by *A. minutissimum*. The diatom assemblages were useful in identifying certain sites that, prior to this study, were thought to be major contributors of AMD, but yielded taxa characteristic of intermediate conditions, suggesting that these sites fluctuate in water chemistry throughout the year. The unique diatom assemblages in these intermediate, oscillating streams (Group II) pinpointed cryptic pollution sites with a greater degree of accuracy than environmental parameters alone.

Floristics and Invasive Species
02:00 PM, Saturday, April 5, 2003
Brewer/Frost Science 109
Dr. Brian C. McCarthy-Presiding

2:00 VASCULAR FLORISTIC ANALYSIS, DOCUMENTATION AND SURVEY OF SALT FORK STATE PARK, GUERNSEY COUNTY, OHIO.

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The Division of Parks and Recreation of the Ohio Dept of Natural Resources currently manages 74 state parks consisting of over 82,554 hectares. Salt Fork State Park, located in Guernsey County, is the largest of these parks encompassing approximately 8167 ha of combined land and water holdings. The purpose of this continuing study is to thoroughly document the vascular plant diversity located within the park. In addition, complete habitat classification throughout the park will ultimately lead to a better understanding of species occurrence within these areas. From, August 1998 to January 2003, this author identified 82 families, 103 genera, and 258 species of vascular plants within park boundaries. In addition, of the 258 species documented thus far, eight comprise new records for Guernsey County. The park has also yielded a healthy population of the state listed, potentially threatened Green-flowered Milkweed, *Asclepias viridiflora*. As of January 2003, voucher specimens, for the majority of the species identified, have been placed in the Muskingum College herbarium. While the majority of state park land is primarily utilized for public recreational use including hunting, fishing, camping and general day-use, many of the areas within these parks are isolated and seldom utilized by the public. Many of these remote areas provide excellent habitat and protection for numerous state listed species. In addition, there is limited knowledge from the majority of these parks regarding the flora and fauna located within their boundaries. It is hoped that this study will ultimately create a template that other parks can use to document floristic diversity and evaluate habitats for floristic diversity potential.

2:15 A REVIEW OF THE NATURAL HISTORY OF THE OHIO CANALS.

Joseph T. Hannibal hannibal@cmnh.org, The Cleveland Museum of Natural History, 1 Wade Oval Dr, Cleveland OH 44106-1767.

Travelers, scientists, and others have noted the biota of the Ohio canals beginning with its initial construction in the 1820s, and have hypothesized that the canals have altered the distribution of certain organisms. This paper reviews previous, and makes new, observations and interpretations concerning the effect of the canals on organisms and their dispersals. Physical characters of Ohio canals included low gradients, high nutrient levels, muddy or sandy bottoms, slow water flow, and often low amounts of dissolved oxygen. Canals were seasonally dewatered due to winter damage and spring repairs. Emergent canal vegetation, known historically as "canal grass," included sedges (*Cyperus* spp.), bulrush (*Scirpus* spp.), and cattail (*Typha* spp.). Contemporary biologists have noted that *T. angustifolia* and the mussel *Elliptio complanata* probably followed canals across the continental divide in Ohio. Published reports and museum specimens (including Cleveland Museum specimens collected from the Walhonding Canal in the 1950s) indicate thriving and/or diverse mussel communities in parts of the canal complex. The mussel *Pyganodon grandis* was reported from the Ohio & Erie Canal by early and recent workers despite its highest glochidia release in winter, when canals were plagued with ice. This mussel is spread partly by yellow perch (*Perca flavescens*), which Jared Kirtland thought was spread via the canal. The distribution of the crayfish *Orconectes rusticus* suggests that it may have also crossed the divide via the Ohio canals. The canal system provided habitat and dispersal routes for these and other aquatic and semiaquatic organisms preadapted for conditions in and along the canals.

2:30 ALL TAXON BIODIVERSITY INVENTORY OF DEEP WOODS, HOCKING COUNTY, OHIO: SURVEY OF TERRESTRIAL MACRO-FUNGI.

Cynthia L. Riccardi Cynthia.Riccardi.1@ohio.edu, Sarah L. Bashore sb332892@ohio.edu, Brian C. McCarthy mccarthy@ohio.edu, Ohio University, Dept of Environmental and Plant Biology, Athens OH 45701

Fungi serve many useful and important functions from decomposing and recycling plant and animal remains to providing edibles such as morels. However, fungi are often poorly studied and frequently ignored in biodiversity studies, compared to other groups of organisms. The objective of this project was to collect, identify, and voucher fruiting bodies of terrestrial macro-fungi at Deep Woods, the site of an all taxon biodiversity inventory (ATBI) sponsored by the Ohio Biological Survey. Deep Woods is 114-ha in size and is comprised of a diversity of habitats including fields, lowland and upland forests, riparian forest, hemlock ravines, sandstone outcrops, and rockhouse formations. During the 2002 growing season, the property was surveyed (selectively walked) approximately every 10 days and fungi were collected and identified. In total, 92 species were collected with 12 species from 6 families in 4 orders of ascomycetes and 74 species from 24 families in 14 orders of basidiomycetes. The fungi were further divided into groups based upon ecological guild: 15 soil-inhabiting, 7 litter-inhabiting, 49 wood-inhabiting, 12 mycorrhizal species, and two other with six unknown. Our data indicate a diverse assemblage of macrofungi that is comparable to other studies in the Central Hardwoods Region. Due to the ephemeral nature of fungal fruiting bodies, multiple years of study would certainly expand the species list. The data contribute to the long-term goals of the Deep Woods

ATBI. Furthermore, the data provide information to understand fungal diversity on a local as well as regional scale to incorporate into conservation and land management plans.

2:45 COMPOSITION, STRUCTURE, AND DIVERSITY OF A CHESTNUT-DOMINATED HARDWOOD FOREST IN SOUTHWESTERN WISCONSIN, USA.

Brian C. McCarthy mccarthy@ohio.edu, Dept of Environmental and Plant Biology, Ohio University, Athens OH 45701, Carolyn H. Keiffer, Dept Plant Biology, Miami University, and Steven H. Rogstad, Dept Biological Sciences, University of Cincinnati.

American chestnut (*Castanea dentata* (Marshall) Borkh.; Fagaceae) was virtually extirpated as a dominant tree species throughout the Appalachian forest region by the 1930s due to the chestnut blight (*Cryphonectria parasitica*; Ascomycota). Fortunately, a small number of disjunct chestnut populations escaped infection throughout the Midwest. One such stand, believed to be the largest, exists near La Crosse, Wisconsin. A settler reportedly planted 12 chestnut trees in the early 1900s, of which 11 exist today (the largest being 127 cm in diameter). Since this initial introduction, American chestnut has naturalized – more than 6,000 individuals now dominate this site. The purpose of our study was to establish a long-term study of forest dynamics, conduct a detailed study of the current composition and structure of the vegetation, and assess the regeneration ecology of chestnut. We established 30 permanent plots, 500 m^2 throughout the stand. Mature trees, saplings, seedlings, shrubs, herbs and groundcover were sampled in each plot. In addition, hemispherical canopy photos and soil samples were taken to describe the microenvironment and regeneration conditions. A total of 27 species were found in the overstory. The total basal area of the stand was 35 $m^2 \cdot ha^{-1}$, of which chestnut accounted for 43%. Chestnut has acted much like an invasive species in colonizing this oak-hickory forest. This occurrence provides considerable hope for restoration ecologists considering the re-introduction of chestnut into oak forest ecosystems, as disease resistant varieties become available.

3:00 DISTRIBUTION PATTERNS IN THE ABUNDANCE OF WILD HARVESTED MEDICINAL HERBS IN THE WAYNE NATIONAL FOREST (OHIO, USA).

Matthew A. Albrecht matthew.albrecht@ohio.edu and Brian C. McCarthy mccarthy@ohio.edu, Dept of Environmental and Plant Biology, 317 Porter Hall, Ohio University, Athens OH 45701

Numerous forest herbs are indiscriminately harvested from National Forests and sold in the profitable herb market. As demand and economic value of wild harvested herbs increases, land managers urgently need baseline ecological data to formulate management policies. We used a strip transect sampling scheme to estimate the abundance and distribution of the seven most popular wild harvested herbs in the Wayne National Forest (WNF). In total, ten forest stands were randomly surveyed with four 1000 m^2 transects that traversed a variety of slope positions, aspects, and forest types. Black cohosh (*Actaea racemosa* L.) was the most abundant and frequently encountered herb (G = 30.7: ou□$P < 0.001$), with 58% of the transects containing at least one ramet. The distribution of black cohosh varied in a complex manner, with north and west facing mid-slopes having the greatest abundance. We encountered only 33 Virginia snakeroot (*Aristolochia serpentaria* L.) ramets and 45 ginseng (*Panax quinquefolius* L.) ramets in the entire sampled area (4 ha). Stands differed significantly ($F = 4.27$; $P < 0.01$) in the abundance of herbs. However, forest stands, classified as "special areas" by the WNF, did not harbor more medicinal herbs than forest stands without this distinct designation (nested ANOVA; $P > 0.05$). No difference in herb density was found between different forest types ($F = 1.61$; $P = 0.16$). The overall patchy distribution and infrequent encounter rate impedes the effective management of these valuable non-timber forest resources.

3:15 COMMUNITY AND LANDSCAPE FEATURES THAT INFLUENCE THE INVASION OF *LONICERA MAACKII*.

Anne M. Bartuszevige, Bartusam@muohio.edu, David L. Gorchov, Dept of Botany, Pearson Hall 316, Miami University, Oxford OH 45056

Although invasive plants are recognized as a major ecological problem, little is known of the role of dispersal agents and landscape structure on the invasion process. *Lonicera maackii* (Rupr.) Herder (Caprifoliaceae) is an invasive, bird-dispersed shrub introduced to the United States in 1898 as an ornamental. It has since become invasive in 24 eastern U.S. states. As part of our investigation into how the invasion of this species is shaped by landscape features and by movement patterns of the birds that disperse its seeds, we explored the relationship between its distribution and woodlot characteristics at the edge of the *L. maackii* invasion in southwest Ohio. During summer 2002, 11 woodlots were sampled using the point quarter method. Basal areas, densities, and importance values of shrubs, saplings and tree species were calculated. For each woodlot, we also calculated mean gap fraction (canopy openness) using a Licor LAI 2000. Digital Ortho Quarter Quad photos and ArcView GIS were used to collect landscape parameters from the same woodlots. Stepwise multiple regression analysis was used to determine the community and landscape factors that best explain *L. maackii* density. The best predictor of woodlot *L. maackii* density was the density of *L. maackii* on the perimeter of the woodlot. This perimeter density, in turn, was best predicted by the number of corridors connecting to other woodlots. Additional woodlots will be sampled in 2003, but results to date suggest that landscape factors are more important than woodlot features in the invasion of *L. maackii*.

3:30 GROWTH OF A NONINDIGENOUS SHRUB, AMUR HONEYSUCKLE (*LONICERA MAACKII*), UNDER VARYING LIGHT, WATER, AND SOIL CONDITIONS.

Kurt M. Hartman kh349592@ohio.edu and Brian C. McCarthy mccarthy@ohio.edu, Dept of Environmental and Plant Biology, Ohio University, Athens OH 45701

Amur honeysuckle (*Lonicera maackii*) is an exotic invasive shrub that has become problematic throughout many regions of the eastern U.S. This shrub is able to invade a habitat by suppressing recruitment of native species, yet *L. maackii* does not equally invade all habitat types. The goal of this experiment was to evaluate its performance under a number of conditions to better understand its potential growth. We used a fully-crossed factorial design with light (10%, 50%, 100% full light), water availability (soil brought to 50% and 100% full water capacity biweekly), and soil type (from glaciated and unglaciated Ohio) as main effects. MANOVA results found soil type to be nonsignificant in predicting growth responses, which indicates equal invasive ability in both glaciated and unglaciated soils. Light, water, and light ´ water treatments were significant ($P < 0.05$). ANOVAs indicated that seedling growth parameters were greatest for all measured variables (except root-shoot ratio and leaf dry matter content) in the high light treatments (either 50 or 100% full light) combined with the 100% water capacity soil treatment. A negative correlation was found between overall growth and root-shoot ratio suggesting that allocation to aboveground biomass, rather than below, occurs when growth conditions are favorable. The least amount of growth occurred in low light-low water conditions; however, no seedling mortality occurred allowing es□*L. maackii* to persist until conditions improve. Because *L. maackii* had the best seedling performance in bright, moist conditions, habitat types with these characteristics should be monitored most closely for future invasion.

3:45 THE EFFECTS OF MULCH TYPE AND DEPTH ON EDAPHIC CONDITIONS AND TREE SEEDLING SURVIVAL ON A CLOSED OHIO LANDFILL.

Erin R. Athy athyer@muohio.edu and Carolyn Howes Keiffer keiffech@muohio.edu, Miami University, Dept of Botany, Oxford OH 45056

Restoration of degraded lands, including brownfields and closed landfills, is increasing in demand. However, many restoration attempts fail due to poor soil conditions (e.g., compacted, low in nutrients and organic matter). Dry, infertile soils that characterize many restoration sites frequently plague agricultural fields as well. Current agricultural strategies often include the use of mulch, which is known to amend soil properties, restore moisture potential, and increase plant growth. Employing similar practices on landfills with similar soil limitations may help to develop new planting strategies for future restoration projects. This study evaluates the effect of mulch type and depth on tree seedling survival and edaphic conditions. The study was performed in 2002 at Center Hill Landfill, Cincinnati, OH where five species of tree seedlings *(Fraxinus pennsylvanica, Robinia pseudoacacia, Prunus serotina, Quercus macrocarpa, Populus* spp.) were planted in a clustered arrangement on each of 35 replicate plots, including non-mulched controls. Three types of mulch (hardwood, leaf, and mixed) were distributed in three depths (0, 5, 15 cm). Gravimetric soil moisture and temperature were taken each month during the growing season. Seedling survival varied by species from *Fraxinus* (97%) to *Prunus* (11%). Mean survival was lowest (50%) in control treatments and highest (64%) in 15 cm hardwood mulch plots. Preliminary analysis suggests 15 cm hardwood mulch had a significant negative impact on herbaceous growth and a positive effect on soil moisture, while 5 cm leaf mulch maintained the lowest and most constant soil temperatures. This information, coupled with additional studies, may help to guide future terrestrial restoration projects.

Plant Biology
09:00 AM, Saturday, April 5, 2003
Brewer/Frost Science 142
Dr. Sarah E. Wyatt-Presiding

9:00 GENETIC DIVERSITY OF *ATRIPLEX PROSTRATA* IN AN INLAND SALT MARSH OVER TIME.

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Many studies have compared genetic variation among populations and between seed banks and aboveground vegetation for a given species. None have assessed changes in genetic diversity for a population over time. Our goal in this investigation was to examine temporal changes in the genetic diversity of *Atriplex prostrata,* an annual halophytic species, found in an inland salt marsh in Rittman, Ohio, by comparing current aboveground diversity with the seed bank and a cohort produced from seeds collected from plants in the marsh in 1981. A total of 90 samples (30 samples for 3 sets of tissue) were extracted for genomic DNA. Inter-simple sequence repeat (ISSR) markers were produced using polymerase chain reaction (PCR) and three different micro-satellite based primers yielding appropriate levels of variation. PCR products were visualized on agarose gels and bands were scored as present or absent using Quantity One v. 4.3 software. The Jaccard coefficient in Numerical Taxonomy and Multivariate Analysis System (NTSYS) was used to produce a similarity matrix from the raw data which was subjected to a Principle Coordinate Analysis (PCO). An Analysis of Molecular Variance (AMOVA) was performed to determine variation within and among the three levels of cohorts. Genetic diversity was found within and among the three sampling levels indicating that diversity of *Atriplex prostrata*, even though it can reproduce autogamously, has been maintained over a 20 y period.

9:15 LIGHT AND INDUCTION OF SECONDARY GROWTH IN ARABIDOPSIS.

Jessica Sterling js242399@ohio.edu, Sarah Bashore, and Sarah E. Wyatt, Dept of Environmental and Plant Biology, Ohio University, Athens OH 45701

Light is a fundamental stimulus governing plant growth and development. It can control everything from seed germination to flower induction. One function of light that has been less explored is its role in moderating secondary or radial growth. Genetic studies of secondary growth have been very difficult and limited by the long generation time and large genome size of forest trees. Through the modification of growth conditions of Arabidopsis, we have shown that inflorescence stems can produce secondary growth. When these inflorescences were allowed to develop in white light for eight days, a greater amount of secondary growth was seen as compared to those placed in total darkness. To determine which wavelength of light (and which receptor) might be responsible for this effect, sixteen *Arabidopsis* plants were grown under short day conditions to enhance rosette size. After the rosettes were large enough to support considerable secondary growth, inflorescence stems were grown to two cm under normal white light and then allowed to continue development for eight days under either blue light or red light. Stems were then fixed, embedded in paraffin and sectioned for microscopy, then viewed under polarized light. Secondary growth was significantly increased in the inflorescence stems grown under red light. Secondary growth was assessed measuring the width of the band of secondary xylem and the total area of the cross section indicating that red light, and therefore phytochrome, may be a major factor in the initiation of secondary growth.

9:30 ASSESSMENT OF VIBRATIONAL STIMULUS ON THE SENSITIVITY OF THE GRAVIRECEPTOR IN ROOTS OF *ARABIDOPSIS THALIANA* (COLUMBIA) AND STARCH-DEFICIENT MUTANTS.

Miranda N. Shaw m-shaw@onu.edu, Jason R. Lesko, (Linda Young l-young@onu.edu, Laurie Laird l-laird@onu.edu), Ohio Northern University, 525 S Main St, Ada OH 45810

The phenomenon of root gravitropic curvature is a three part process: gravity perception in the cap via a starch statolith-based gravisensor; signal transduction resulting in the modification of basipetal auxin flux patterns; and downward curvature due to differential growth rates on the upper and lower root surfaces. While gravity causes the sedimentation of starch-laden amyloplasts during perception, background vibration may be partially counteracting this stimulus. We hypothesize that vibration dampened conditions will result in enhanced gravicurvature since only the force of gravity is detected. Under vibration enhanced conditions, we predict reduced curvature as vibrations are counteracting the gravity stimulus. Experiments were performed to analyze growth rates, curvature rates, and the extent of curvature in roots of *Arabidopsis thaliana* (Columbia) plus in reduced-starch (ACG) and starchless (Tc7) mutants. All plants were grown in Petri dishes containing ½ MS growth medium with 1 mM MES, 1% sucrose and 1.5% agar, pH = 5.8. Prior to planting, seeds were surface sterilized with NaOCl. Control experiments monitored roots under normal laboratory conditions for straight growth and gravicurvature. This was accomplished by utilizing two jigs to mount the seedlings and a digital camera for image capture/analysis every 30 min for 8 hours. These experiments were repeated under vibration dampened conditions and vibration enhanced conditions (frequencies of 2 cycles/min and 60 cycles/min). An accelerometer measured vibrations during experimentation and a data acquisition program collected these values.

9:45 CHARACTERIZATION OF AUXIN TRANSPORT IN THE *gps* MUTANTS OF ARABIDOPSIS.

Vijayanand Nadella[1] vn309200@ohio.edu, Gloria Muday[2] and Sarah Wyatt[1] wyatts@ohio.edu, [1]Dept of Environmental and Plant Biology, Ohio University, Athens OH 45701 and [2]Wake forest University

The *gps* (gravity persistent signal) mutants of Arabidopsis have an abnormal response when gravistimulated at 4°C and returned to vertical at room temperature. *gps1* doesn't respond, *gps2* bends in the opposite direction to wildtype and *gps3* over-responds curving to an angle greater than the wildtype. At 4°C, starch-containing statoliths sedimented normally in wildtype but auxin transport was abolished indicating that the mutants are affected in an aspect of signal transduction that occurs after statolith sedimentation but prior to auxin transport. The goal of this work was to characterize auxin transport in the *gps* mutants to gain insight into the signal transduction events leading to the establishment of the auxin gradient required for the gravity response. Pulse- chase studies done using [^{3}H]-IAA indicate that the polar auxin transport was increased in *gps1* after gravistimulation at 4°C, although the mutant showed no gravitropic bending under these conditions. *gps2* shows normal polar auxin transport even though it bends in the opposite direction. Our data on *gps3* suggests that polar auxin transport is increased, which could provide a mechanism to lead to the elevated response to gravity stimulation in the cold (N=9 plants and 3 trials for every study). Unfortunately, the auxin transport studies do not allow the assessment of asymmetric redistribution of auxin. To further our knowledge, asymmetric auxin redistribution is being assessed in the mutants using immunostaining and expression of a pIAA2 auxin responsive promoter: GUS gene fusion in the inflorescence to determine if the mutations alter lateral auxin transport. (Partially supported by ASGSB, USDA and by NSCORT at NCSU)

10:00 Break

10:15 ESTABLISHING ARABIDOPSIS AS A MODEL FOR TENSION WOOD FORMATION.

Sarah E. Wyatt wyatts@ohio.edu, Dept of Environmental and Plant Biology, Ohio University, Athens OH 45701

Trees and herbaceous plants continuously respond to their environment to maintain appropriate stem growth and regulate optimal branch orientation. Tension wood is formed by woody dicotyledons to generate the force necessary for reorientation of branches and stems following gravistimulation or loss of apical dominance. However, tension wood causes sawn timber to split, shrink or collapse. The study of the genetic mechanisms underlying tension wood formation has been greatly limited by the size and long generation times of forest trees. Our goal is to establish *Arabidopsis thaliana* as a model for the study of tension wood formation. Although not normally thought of as a woody plant, when grown appropriately Arabidopsis does form secondary xylem. By reducing plant density and clipping inflorescence stems, we were able to delay senescence of the rosette, increase rosette size, and increase the production of secondary xylem. Initially, 50 plants were grown under these conditions, 25 plants were then gravistimulated by tilting to induce tension wood formation and 25 were left vertical to serve as a control. Microscopic examination of the tissue from the gravistimulated plants showed an unusually wide cambial zone, dilatation of the cortex, and the typical blue-green (as stained by Alcian blue) gelatinous fibers characteristic of tension wood. Establishment of methodologies to use Arabidopsis as a model for tension wood formation will enable the use of the vast, detailed knowledge of *Arabidopsis* genetics and genomics to the advanced study of tension wood.

10:30 THE GRAVITY PERSISTENT SIGNAL (GPS) MUTANTS OF ARABIDOPSIS: THE SEARCH FOR A GENE.

Matthew J. Shipp m_shipp22@yahoo.com and Sarah E. Wyatt, Dept of Environmental and Plant Biology, Ohio University, Athens OH 45701

Gravity is a fundamental factor governing plant growth and development. Although much is known about how plants are affected by gravity. Little is known about the components of signal transduction pathway that link these events. In hope of identifying genes involved in the signal transduction events, we used a cold treatment to isolate the events of signal transduction and have identified three recessive mutants from a T-DNA tagged population of Arabidopsis. *gps1-1* did not bend in response to the 4°C gravity stimulus upon return to room temperature. *gps2-1* responded to the 4°C stimulus but bent in the opposite direction. *gps3-1* over-responded after return to room temperature, continuing to bend to an angle greater than wild-type plants. Characterization of several growth parameters indicates that the gps mutants are normal in all respects except for their response to gravistimulation at 4°C. In addition, at 4°C amyloplasts sedimented normally in the *gps* mutants, indicating that the GPS loci affect an aspect of the gravity signal perception/transduction pathway that occurs after amyloplast sedimentation (perception). With the initial characterization complete, work has shifted to identification of the GPS genes. This is being accomplished through polymerase chain reaction (PCR) techniques based on the T-DNA insert to isolate the region on the genome where the GPS genes are located. Partially support by the Program to Aid Career Enhancement, Ohio University, and the United States Dept of Agriculture.

10:45 MYCORRHIZAL COLONIZATION OF AMERICAN CHESTNUT SEEDLINGS FROM SITES EXPOSED TO PRESCRIBED FIRE AND/OR OVERSTORY THINNING.

Carolyn J. McQuattie[1] cmcquattie@fs.fed.us, Corinne McCament[2] cbmcc@frognet.net, Brian McCarthy[2] mccarthy@oak.cats.ohiou.edu, [1]USDA Forest Service, 359 Main Rd, Delaware OH 43015, and [2]Ohio University

The potential for establishment of blight-resistant American chestnut (*Castanea dentata)* in Ohio forests has led to renewed interest in chestnut seedling growth and survival. Mycorrhizal fungal colonization of roots, which usually results in increased nutrient uptake, may improve seedling survival on disturbed forest sites. In May 2002, 400 chestnut seeds were planted in Vinton County, OH on four treatment sites: undisturbed site, control (C); overstory thinned by 29% (T); forest floor exposed to a prescribed burn in spring 2001 (B); combination of burned plus thinned (B+T). The study objectives were to describe mycorrhizal root morphology and to determine percent colonization of seedling roots after one growing season. In October 2002, three representative lateral roots from each of three seedlings per treatment were chemically preserved. All short roots on each lateral root were examined for mycorrhizal colonization. Root tips were subsequently embedded in epoxy resin and sectioned to verify mycorrhizal root structure. Chestnut roots from each treatment were ectomycorrhizal, with definite hyphal mantle and Hartig net development. Percent colonization of short roots varied by treatment: C, 36%; T, 53%; B, 71%; T+B, 78% ($p = 0.10$). Greater mycorrhizal colonization of roots associated with treatments may be related to micro-site changes such as increased light levels (T), altered soil temperatures, moisture or nutrient levels (B), or some combination (T+B). Additional root collections are planned over the next several years to monitor longer term effects of treatments on mycorrhizal associations.

Plant Ecology
02:00 PM, Saturday, April 5, 2003
Brewer/Frost Science 142
Dr. Cadance A. Lowell-Presiding

2:00 VARIATION IN FLOWERING PHENOLOGY CHARACTERISTICS IN THE NORTH AMERICAN DANDELION *TARAXACUM OFFICINALE* (ASTERACEAE).

Matthew H. Collier[1], mcollier@wittenberg.edu, and Steven H. Rogstad[2], rogstad@email.uc.edu, [1]Wittenberg University, Dept of Biology, PO Box 720, Springfield OH 45501-0720 and -[2]University of Cincinnati

We investigated the hypothesis that dandelion (*Taraxacum officinale* Weber, *sensu lato*; *Asteraceae*) clones differ in their floral stage timing characteristics under a constant set of environmental conditions. To test this hypothesis, plants representing nine different dandelion clones (identified by DNA fingerprinting) were grown in groups of five (N = 45) in a growth chamber for a period of eight months, with chamber settings similar to environmental conditions at peak dandelion flowering time for their population sites. Five flowering phenology parameters were monitored daily for a total of 301 buds developing during this time: 1) time to bud; 2) time to inflorescence (i.e., anthesis); 3) time to re-closure of inflorescence; 4) time to fruit (full re-opening of the inflorescence); and 5) total flowering time. Significant differences in mean time to inflorescence, mean time to re-closure, mean time to fruit, and mean total flowering time were revealed among some dandelion clones (ANOVA, P d•0.05). No differences in mean number of buds per plant ($P = 0.0852$) or mean time to bud ($P = 0.8240$) were detected among the nine clones. These results suggest that some differences in floral stage timing may largely be determined by variation in genotypes that have different responses to uniform environmental conditions among dandelion clones, rather than exclusively by phenotypic plastic responses affected by micro-environmental factors. These differences may have potential fitness effects. Further research is needed to determine if such clonal differences are observed under a broader range of uniform environmental conditions.

2:15 RESPONSE OF *Acorus calamus* L. LEAF GROWTH TO SHADE AND NUTRIENT TREATMENTS.

Aswini Pai ap345389@ohio.edu and Brian C. McCarthy, Dept of Plant and Environmental Biology, Ohio University, Athens OH 45701

Acorus calamus L. (Acoraceae) is an emergent macrophyte found along vernal water bodies in unglaciated Ohio. It has economic potential as a source of medicine for stomach ailments and is also considered useful for wetland restoration. Shoots of the plant consist of long sword - like leaves with equitant leaf bases arising from a geophytic rhizome. We investigated optimal growth parameters of *A. calamus* rhizome with respect to nutrient and shade. We planted rhizomes of *A. calamus* that were 5 cm in length in 15 cm aquatic pot containers and subjected them to different shade (50 % shade and full sun) and nutrient levels (0.225 g ml^{-1} N and 0.75 mg ml^{-1} N applied semi weekly). Number of leaves, total leaf area and number of buds were observed at the end of ninety days. Analysis of variance indicated that there was no significant difference ($F = 0.21$, $p > 0.5$) in number of buds among shade treatments though there was a significant response ($F = 22.01$, $p < 0.0001$) to nutrient treatments. Total number of leaves varied significantly among light ($F = 14.47$, $p < 0.0001$) and nutrient ($F = 23.07$, $p < 0.0001$) treatments. Total leaf area varied significantly both among light ($F = 17.57$, $p < 0.0001$) and nutrient ($F = 28.78$, $p < 0.0001$) treatments. There were no significant interactions among treatments for any of the measured growth responses. Results suggest that light and nutrient availability may be limiting factors for optimal growth of the plant.

2:30 EFFECTS OF A COAL-BURNING POWER PLANT ON A POPULATION OF *ACER SACCHARINUM* TREES IN CENTRAL OHIO.

Jack S. Byrom rhonjack@ix.netcom.com, (Alan Stam astam@capital.edu), Capital University, 2199 E Main St, Columbus OH 43209

Coal-fired power plants are the major source of electrical power generation in the United States. Coal combustion produces air pollutants, including sulfur dioxide, which in heavy concentrations are known to inhibit the growth of trees. In 1980 the AEP Picaway power plant in Central Ohio shut down its short, roof-mounted smokestacks and began directing all emissions through an 88-meter smokestack. The assumption was made that the amount of pollutants reaching *Acer Saccharinum* (silver maple) trees within 3.5 km of the plant was then reduced. This study was an attempt to discover if these theoretically reduced pollutant levels had a positive effect on the growth of silver maple trees 1.5 to 3.5 km from the emission source. Tree increment cores from 12 trees were taken, measured, and the mean annual growth for the years 1966-2001 was calculated. *A saccharinum* is a diffuse porous ring species, and the ring boundaries are often hard to determine. A combination of laser light diffusion and chemical treatment (5% phloroglucinol and 6 M HCl treatment) was used to highlight ring boundaries for easier measurement. The mean annual growth of the population before 1980 (95% CI, 6.09 ± 0.50 mm), was compared to the mean annual growth of the population after 1980 (95% CI, 5.82 ± 0.32 mm), and no statistical difference was found between the two means (p= 0.307 > 0.05). No significant difference in mean tree ring growth due to the change in pollutant emission patterns can be proven from the analysis of this data.

2:45 AN ECOLOGICAL STUDY OF QUEEN OF THE PRAIRIE (*FILIPENDULA RUBRA*).

Amy L. Garchar amygarchar@yahoo.com, (Courtenay N. Willis cnwillis@cc.ysu.edu), Youngstown State University, Dept of Biological Sciences, Youngstown OH 44555

Filipendula rubra (Rosaceae) is a perennial herb native to calcareous fens in the northcentral United States. Although *F. rubra* has high seed production, most are inviable because *F. rubra* is self-incompatible. Knowledge of the life history of *F. rubra* will provide insight into the conservation of this species and its unique habitat. The goal of this study was to investigate factors that influence the reproductive success and distribution of *F. rubra*. In 2002, seed production, plant density, and pollinator abundance were measured at four fens: Jackson Bog in northeast Ohio and Gallagher/Springfield Fen, Kiser Lake Wetlands, and Prairie Road Fen in west-central Ohio. Plants (N = 20) at each site were randomly selected and tagged in order to determine seed production and pollinator abundance. Plots (N = 16) were selected that included the 20 tagged plants in order to determine plant density. In addition, associated plant species and soil samples were collected in order to compare habitat characteristics between the sites. An increase in plant density tended to be correlated with an increase in seed production ($\tilde{}P = 0.10$) and pollinator abundance ($P = 0.10$). In addition, pollinator abundance tended to be correlated with the number of viable achenes ($P = 0.10$). These results suggest that plant density and pollinator abundance may influence the reproduction and establishment of this fen species.

3:00 Break

3:15 SLOW PLANTS IN A FOREST FOREST: CONSEQUENCES OF FOREST LAND USE HISTORY FOR THE DISTRIBUTION OF WILDFLOWERS.

Glenn R. Matlack matlack@ ohio.edu, Environmental and Plant Biology, Porter Hall, Ohio University, Athens OH 45701

Although we now have more forest in the eastern United States that at any time in the last 200 years, the forest flora appears to be species-poor at most sites. Observations of gradual species accumulation in deciduous forest stands in North America and Europe suggest that many herbaceous species are strongly dispersal-limited. Extension of population-level dispersal limitation to a regional scale is tested with a spatially explicit cellular automaton model. In the model habitat islands arise and disappear, and a hypothetical herb species disperses among them. Results: The model shows that regional distributions are limited

by habitat connectivity at low forest frequency (i.e. forest occupies a low proportion of the landscape) and by dispersal rate at high forest frequency. Allowing random destruction/regeneration of forest stands in the model seriously reduces the frequency of species of low dispersal ability, but also impacts highly mobile species. A comparison of computer-predicted frequencies with regional frequencies of 36 wildflower species observed in forests of the Delaware River Valley indicates that dispersal limitation has determined the regional abundance of species dispersed by ants, spores, and wind, and those without vectors. Vertebrate-dispersed species are poorly predicted. The work suggests that biological diversity may best be conserved by identification and protection of old-forest refugia; young forest is of little conservation value because it has not yet been colonized.

3:30 RESTORTATION ECOLOGY: REINTRODUCTION TRIALS OF AMERICAN CHESTNUT, *CASTANEA DENTATA,* IN A MIXED OAK FOREST ECOSYSTEM IN SOUTHEAST OHIO.

Corinne McCament cbmcc@frognet.net and Brian C. McCarthy mccarthy@ohio.edu, Dept of Environmental and Plant Biology, Ohio University, Athens OH 45701

Castanea dentata was once a major component of northeast forests before the arrival of the chestnut blight *Cryphonectria parasitica* in the early 1900's. A blight resistant variety of American chestnut is scheduled to be available for large scale restoration efforts within the next decade. The purpose of this study was to evaluate the forest microenvironments best suited to *C. dentata* seed germination and seedling survival. Blight sensitive seeds were used to evaluate the best target environments for future plantings of blight resistant seeds. Blight sensitive seeds were used because resistant seeds are not available and young seedlings (one year old) were evaluated at an age when they are not sensitive to blight. One hundred seeds were planted in each of four silvicultural units (control, burn, thin, and thin and burn) in three forests (Raccoon Ecological Management Area, Tar Hollow State Forest, and Zaleski State Forest, Ohio) for a total of 1200 seeds. Germination and seedling survival percentages were observed throughout the months of June, July, August, and September. Results indicate that there was no significant difference in germination between forest type ($H = 22.40$, $p > 0.0001$) or between treatments ($H = 2.21$, $p > 0.5$). There was no significant difference in survival between forest type ($H = 2.62$, $p > 0.2$) or between treatments ($H = 0.55$, $p > 0.9$). There were no significant interactions between forest and units for any test. Results suggest that local site characteristics such as microenvironments, soil quality, or mycorrhizae may be more influential in determining seed germination and that seedlings will do well under a broad array of forest management conditions.

3:45 DENDROCLIMATOLOGICAL ANALYSIS OF EASTERN HEMLOCK (TSUGA CANADENSIS L.) IN SOUTHEASTERN OHIO, USA.

Scott A. Weaver sw226499@ohio.edu, Brian C. McCarthy mccarthy@ohio.edu, Dept of Environmental and Plant Biology, Ohio University, Athens OH 45701

Dendroclimatological techniques were applied to eastern hemlock growing in Hocking County, OH to determine the relationship between radial growth and climate. Increment cores were obtained from trees sampled on sandstone ledges (N = 10) and forest interiors (N = 14) to evaluate the effect of site quality on climate signals. Increment cores were obtained, prepared, and cross-dated using standard protocols, from which a master ring-width chronology spanning 201 years (1800-2000) was developed. Monthly climatic variables (temperature, precipitation, and Palmer Drought Severity Index) were obtained for the current and previous growing seasons (1895-2000). The master ring width chronology and each of the two subset chronologies were significantly ($P < 0.05$) correlated with growing season drought severity and precipitation. Temperature was generally uncorrelated with growth. While the mean (± SE) annual growth of forest trees (1.92 mm ± 0.05) compared to ledge trees (1.39 ± 0.03) was significantly different ($Z = 8.6$, $P < 0.001$), both were significantly ($P < 0.05$) correlated with drought severity from June of the previous year to September of the current year. The ledge trees showed a greater degree of correlation with the months prior to the current growing season (previous November to current March), while the forest trees showed a stronger correlation with the current growing season (April through September). Differences in soil depth, competition, and transpiration are the most likely explanation for the observed response patterns.

4:00 A PRELIMINARY STUDY FOR THE POTENTIAL USE OF *PSEUDOMONAS SYRINGAE* PV *TAGETIS* AS A BIOLOGICAL CONTROL OF CANADA THISTLE (*CIRSIUM ARVENSE*) IN OHIO AGRICULTURE.

Fukumi Aikawa f-aikawa@onu.edu, 910 Northernview Apt.30, Ada OH 45810

The Canada Thistle (*Cirsium arvense*) is a common weed found in the USA and Canada where it causes many agriculture problems. *Pseudomonas syringae* pv. *tagetis*, the pathogen which causes severe chlorosis of the stem apex of these plants, has possibility for controlling the Canada Thistle. We examined various vegetative structures of both control and affected plants to determine the extent of *Pseudomonas* infection in the terms of microbe population size and distribution within the plant. A total of seventeen plants were harvested from four different sites in Ohio. Tissues from stem apex, green leaves, stem and rhizome were homogenized with M9 broth and spread onto both *Pseudomonas* selection agar and Bacto *Pseudomonas* isolation agar. The number of colonies was counted after incubation for 48 hours at 37°C. The identification of *Pseudomonas* was confirmed via Gram staining and the oxidase test. Preliminary results using the isolation agar indicate that *Pseudomonas* was present in all tissues tested from affected plants (mean values: stem apex= 50, rhizome= 76, green leaves= 9 and stem= 10). This represents substantially greater infection of the plant apices and rhizomes relative to leaves and stem as the difference between these means is statistically significant (Duncan's multiple range test: stem apex= 66.8, rhizomes= 62.9, green leaves= 21.0 and stem= 20.3). Since plants were tested in the late summer/early fall, it is hypothesized that the *Pseudomonas* may be undergoing relocation from infected apices to rhizomes to over the winter.

Medicine

09:00 AM, Saturday, April 5, 2003

Brewer/Frost Science 141

Dr. Nancy J. Swails-Presiding

9:00 HISTOPATHOLOGY OF SPONTANEOUS DENTAL IMPLANT EXPOSURE.

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Endosseous dental implants are becoming a common treatment option in the practice of dentistry and have shown great promise for being able to restore dental function and esthetics. Spontaneous exposure of endosseous dental implants is a complication that can be indicative of later implant failure, but few definitive studies have been conducted concerning this histological phenomenon. In this study, literature review of relevant clinical and laboratory studies, along with clinical observations, were conducted to determine the histopathological factors associated with the spontaneous exposure, and subsequent failure, of endosseous dental implant systems during phase I (implant phase) of treatment. Fifteen peer-reviewed studies (1997-2001) of endosseous dental implant complications and failure, published over a five-year period, were reviewed. Clinical observations (N=95) of maxillary and mandibular (edentulous and partial dentition) surgical placement of single-unit, endosseous dental implants were conducted over a three-month period, to gain further knowledge of treatment procedures. All patients were in good health, and no control group was used. The studies were initially categorized by ascending chronology to evaluate the development of a definitive etiology. The studies were then classified as comprehensive or specialized, and evaluated. Initial results indicated that several factors involving the technique-sensitive surgical procedure contribute to the primary, soft tissue, inflammation response of spontaneous dental implant exposure. It was also noted that no definitive, uniform protocol exists for diagnosing this complication.

9:15 THE EFFECTS OF A KETOGENIC DIET ON BRAIN METABOLISM IN A HYPOXIC ENVIRONMENT.

Douglas S. Emancipator[1] emanci_d@hotmail.com, Michelle A. Puchowicz[2], Kui Xu[2], Joseph C. LaManna[2], [1]Biology Dept., Ursuline College, 2550 Lander Rd, Pepper Pike OH 44124 and Case Western Reserve University,

Chronic hypoxia promotes many metabolic changes in brain tissue, especially increased lactate concentration. Under certain conditions of low glucose, such as starvation, ketones (²-hydroxybutyrate; BHB + acetoacetate) serve as an alternative energy substrate to glucose in the brain and other tissues. Elevated plasma ketones (ketosis) often leads to ketoacidosis. Hypoxia can cause lactate accumulation in brain tissue. Thus, one might expect that the combination, ketosis and lactic acid accumulation, might be additive in brains of rats exposed to hypoxic conditions. Nonetheless, we hypothesized that ketosis would reduce lactate levels in hypoxic brain tissue, maintaining health comparable to normoxia. We investigated the effects of ketosis induced by feeding a ketogenic (high fat) diet on the brain's responses to hypoxia. 24 Male Wistar rats (60g) were equilibrated on either standard, ketogenic or carbohydrate-rich (low fat) diets for three weeks; subgroups (n=4 each) were maintained in a hypobaric (380 torr) or normobaric atmosphere for another three weeks. At sacrifice, lactate, ketones and glucose concentrations in brain homogenates and plasma were measured. The ketogenic diet group increased BHB tissue levels 3-10 fold in either normoxic or hypoxic states. In chronic hypoxia, rats on standard diet showed a 36% increase in brain lactate levels compared to normoxia ($t=2.8$, $p<0.05$). However, in the hypoxic-

ketogenic diet group, the brain lactate levels were normalized ($t=2.2$, $p<0.05$) compared to hypoxic rats fed a standard diet. We conclude that availability of ketones ameliorates the effects of hypoxia on lactate levels in the brain and may mitigate the effects of hypoxia on cerebral function.

9:30 PREDICTION OF THE FIRST CASE OF WEST NILE IN 2003 IN GREENE COUNTY, OHIO.

DONALD E. BRANNEN DBRANNEN@GCCHD.ORG, MARK A. MCDONNELL MMCDONNELL@GCCHD.ORG, GREENE COUNTY COMBINED HEALTH DISTRICT, 360 WILSON DR, XENIA OH 45385

The Greene County Combined Health District (GCCHD) provides public health services to a population of 147,886 over 414.9 square miles. A surveillance plan was implemented by GCCHD to detect infection with West Nile Virus (WNV). It is hypothesized that 2002 dead bird (DB) surveillance data can be used to predict the first human case of WNV encephalitis in Greene County in 2003. The combined jurisdiction of the City and Township of Beavercreek was chosen based upon the jurisdiction's 2002 DB density and location near wooded and wetland reserves. The critical indicator was set at 1.5 DB per square mile per week (for a total of 73 DB in a one-week period) that might give a 2-week early warning of the first WNV case. DB reports were taken from week 16 to 39 of Greene County 2002 data and the total per week was forecasted for the next mosquito season by calculating an equation of best fit: $y = 5E\text{-}05x^6 - 0.0027x^5 + 0.0443x^4 - 0.2555x^3 + 0.1951x^2 + 1.6392x - 1.1589$. This equation was not used previously but the 2002 data appears similar to other reports. If 2003 weather conditions are similar to 2002, then the fourth week of next year's mosquito season when DB density exceeds 73 DB per week, should predict the first Greene County human case of WNV by the sixth week. If the epidemic curve in 2003 follows a polynomial distribution, additional measures may need to be taken to limit human WNV exposure in Greene County.

9:45 THE EFFECTS OF LAVENDER OIL ON THE VISUAL PROCESSING ABILITIES OF COLLEGE-AGED ADULTS VERSUS ELEMENTARY-AGED CHILDREN.

JULIE A. MAUND J-MAUND@ONU.EDU (NANCY WOODLEY N-WOODLEY@ONU.EDU), OHIO NORTHERN UNIVERSITY, UNIT # 2555 402 W COLLEGE AVE, ADA OH 45810

English lavender, *Lavendula angustifolia* is one of the most widely used aroma-therapeutic agents and has been claimed to have a variety of effects including relaxation and stress relief. Some evidence indicates relaxing effects on the autonomic nervous system can, in turn, enhance certain cognitive functions. Two groups of subjects were recruited for this study. An adult group (n=13) was comprised of 6 males and 7 females aged 19 to 22; and the child's group (n=15) was comprised of 4 males and 11 females aged 6 to 10. The effects of lavender oil administered under three conditions on the visual processing abilities of adult subjects as compared to children subjects were tested. The conditions consisted of no aroma (control condition), low exposure to lavender oil (essential oil diffuser that diffused the lavender oil throughout the room), and high exposure to lavender oil (pinning a lavender soaked cotton ball to the subjects' shoulder). Subjects were given two simple visual processing tests per trial: a twenty-four-piece puzzle, and a simple word search to perform in the presence and absence of lavender oil. Tests differed only in content under each of the three testing conditions and each subject served as his/her own control. Time to completion was measured in seconds to determine if lavender could increase performance time without sacrificing accuracy, as compared to the control condition. The results indicated no significant change in subjects' performance times ($\alpha=0.05$) under any condition in either age group. In conclusion, under these testing conditions lavender oil did not appear to affect cognitive function.

10:00 DO AMERICANS CONSIDER THE FOOD SUPPLY TO BE AT RISK FROM A TERRORIST ATTACK?

DIANA M. SPILLMAN SPILLMDM@MUOHIO.EDU, 100E PHILLIPS HALL, MIAMI UNIVERSITY, OXFORD OH 45056

Since the attacks of 9/11, 2001, Americans have been told to be alert and observant. There have been heightened transportation checks and the development of an alert system by color as well as the establishment of a Homeland Security Dept. With all of these precautions does the average citizen feel that the food supply is a risk from a terrorist attack? Have people changed their food habits since 9/11? This research was to investigate if Americans feel that the food supply is in danger and if their food habits have changed in any way due to the traumatic events. A survey was developed and field-tested, before being sent to 500 individuals (ns) in Indiana, Illinois, Missouri, Kansas, Tennessee, Ohio, and Iowa. The participants were selected at random using telephone books. A convenience sample of 200 students (s) was also surveyed. The results indicated that only 9% [45 (ns) and 18 (s)] have changed their food habits since 9/11. A few [15 ns (.03%) and 10 s (.05%)] reported heighten awareness of surrounds, such as restaurants. Seventy-eight (15.6%) non-students and 30 (15%) students responded that they eat more desserts and foods they want. However, over 57% (284) of the non-students and 60% (122) of the students felt that that the food supply was at risk for biological, nuclear or other contamination risk. The greatest concerned mentioned by both non-students [78% (390)] and students [81% (162)] was water. The students [45% (90)] mentioned contamination of fast foods such as colas or beef patties, while this concerned only 13% (65) of the non-students. There were concerns about risks to our food supply and a few personal changes. These concerns were not restricted to age, education, income or gender.

10:15 TRICLOSAN RESISTANT BACTERIA FOUND IN NORTHEASTERN OHIO.

MICHAEL D'ONOFRIO MDONOFRIO@URSULINE.EDU, (BRITT A. BUNYARD BBUNYARD@URSULINE.EDU), BIOLOGY DEPT, DAUBY SCIENCE CENTER, URSULINE COLLEGE, 2550 LANDER RD., PEPPER PIKE OH 44124

Today, we are finding more bacteria that are resistant to antimicrobials. Microorganisms such as methicillin resistant *Staphylococcus aureus* (MRSA) and vancomycin resistant enterrococci (VRE) are complicating medical treatments. There is also the lingering fear that terrorists may use resistant bacteria as a weapon. Triclosan (also known by the trade name Irgasan) is an antimicrobial agent used in many household products like soap, deodorants, and even children's toys. Overuse of this antimicrobial agent can cause two problems. First, susceptible bacteria that do not succumb to triclosan may develop resistance. Second, bacteria resistant to triclosan may develop cross-resistance to other antimicrobials. The goal of this experiment is to find bacteria resistant to triclosan and to further test to see if these bacteria will grow in environments containing increased amounts of the antimicrobial. Three hundred and one samples were collected from the Ursuline College campus, two private homes and a public park to find bacteria that were resistant to triclosan. Of these samples, ten to fifteen were estimated to have resistant bacteria. The samples were cultured on Pseudomonas Isolation Agar. Resistant bacteria will be further tested for resistance by adding increasing amounts of triclosan to Tryptic Soy Agar media. *Pseudomonas aeruginosa* is expected to be the most common bacteria found because it is naturally resistant to triclosan.

10:30 RESISTANCE OF *E.COLI* AND SALMONELLA FROM DOGS TO COMMONLY PRESCRIBED VETERINARY ANTIBIOTICS.

ERICA L. WISE E-WISE@ONU.EDU, OHIO NORTHERN UNIVERSITY, 525 S MAIN ST, ADA OH 45810

Pathogenic bacteria demonstrating antibiotic resistance are becoming a serious problem in all medical fields. This study aimed to determine the comparative levels of antibiotic resistance to commonly prescribed antibiotics used in veterinary medicine. *Salmonella* and *Escherichia coli* were collected from local populations of dogs with diarrhea. Diarrhea samples were collected from three veterinary clinics and cultured on Eosin Methylene Blue agar to isolate colonies. A total of 24 possible samples of *E. coli* and 2 of *Salmonella* have been tested against five antibiotics by disk-diffusion on Meuller-Hinton agar. Zones of inhibition were measured and compared with standards to determine resistance. Preliminary results indicate: 3.8% show resistance to gentimycin, 7.7% to sulfamethoxazole-trimethoprim, 7.7% to Nalidixic acid, 65% to ampicillin, and 92% to clindamycin. Resistance to two or more of the antibiotics was found in 62% of the isolates. Conclusions from these data indicate that diseases caused by *Salmonella* and *E. coli* (such as diarrhea or urinary tract infections) should not be treated with clindamycin and ampicillin. These tests also point out the need to curb over-prescription of antibiotics to prevent selection of drug resistance.

10:45 MULTIGENERATIONAL EFFCTS OF POLYCHLORINATED BIPHENYLS ON THE REPRODUCTION, ESTROUS CYCLES AND ORGAN WEIGHTS OF SPRAGUE-DAWLEY RATS.

CHRISTINA M. CARRUTHERS SMILNAK@BGNET.BGSU.EDU, LEE A. MESERVE LMESERV@BGNET.BGSU.EDU, DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403-0212

Polychlorinated biphenyls (PCB) are synthetic chemicals with hundreds of industrial applications because of their stability. Because of bioaccumulation, they have been found to cause many health problems in animals. In this study, we examined multigenerational effects of PCB on Sprague-Dawley rats fed a diet containing one of three types of PCB (PCB 77, PCB 47, or AROCLOR 1254) in one of two concentrations (1.25ppm or 12.5ppm), mated to the F2 generation. The FDA allows foodstuffs to contain no more than 3ppm. Therefore the concentrations used reflect an accepted amount and an elevated amount. Estrous cycles were monitored in female rats. Animals were euthanized and liver, thyroid gland, testes, uterus and ovaries were removed and weighed. Blood serum was collected for thyroid hormone assay. Data were analyzed using a one way ANOVA. PCB significantly extended the length of estrous cycles ($P=<0.0001$) and delayed mating in cohabitating pairs of rats. Exposure to PCB variably influenced organ weights compared to those of unexposed rats. With few exceptions, although not significant, treatment groups experienced an increase in ovarian weights. High and low doses of each PCB type caused a general

increase in the uterine weight in F2 females. A general, but not significant decrease in testis weight was observed in most treatment groups. A significant increase in thyroid weight was seen in female rats for high and low doses of all congeners studied, with a similar trend of a general increase in thyroid weight, PCB exposed males. Overall, a trend toward depression in liver weight occurred in F2 females, while the liver weights of males were variable. Thyroid hormone levels were altered in treatment animals. These results suggest that PCB effects over two generations differ from those in the first generation.

Molecular Biology and Genetics
02:00 PM, Saturday, April 5, 2003
Brewer/Frost Science 141
Dr. Beth Berger Pritts-Presiding

2:00 REGULATION OF ION CURRENTS IN *PARAMECIUM TETRAURELIA* BY TYPE-1 PROTEIN PHOSPHATASES W, C, AND J ISOFORMS.

Whitman B. Schofield Wschofield@Wooster.edu, (Dean Fraga dfraga@Wooster.edu), 1189 Beall Ave C-2676, Wooster OH 44691

The understanding of excitable cell membrane responses to stimuli is dependent on the identification of underlying enzymatic processes that regulate the ion channels, which coordinate action potentials. The swimming behavior of *Paramecium tetralelia* is controlled by a calcium-based action potential, generated by the coordinated activity of a series of ion channels. This study examined the effect of silencing type-1 protein phosphatases (PP1) isoforms on the backward swimming behavior of *Paramecium* to identify which isoforms regulate which ion currents. Bacterial mediated RNA interference (RNAi) was used to knock out PP1-w, c, and j isoforms. Feeding *Paramecium* with bacteria engineered to express PP1w1 dsRNA resulted in a significant increase in the duration of the protist's backward swimming response to 5 mM Na^+/1 mM TEA in five independent trials (@P<.05). The same cell lines gave no altered response when tested in 30 mM KCl in which only the voltage-dependent Ca^{2+} channel is active, indicating that PP1w does not regulate the channel. The *Paramecium* mutant *cam*^{1} that lacks the calcium-dependent K^+ current, also showed no significant alteration in backwards swimming response in PP1w RNAi feeding experiments, indicating that the calcium-dependent K^+ current may be regulated by PP1w. These data are in agreement with previous PP1w1 antisense silencing results, adding to the growing body of evidence that *Paramecium* PP1 isoforms w regulates Ca^{2+}-dependent K^+ channels. It is currently being determined if the target PP1w was the only isoform affected in the silencing experiments. Additionally the same RNAi silencing experiments of the other PP1 isoforms, C, and J are currently in progress.

2:15 GENERATING A TISSUE SPECIFIC KNOCKOUT OF *RAD51D* IN MICE.

Kylie A. Roach k-roach@onu.edu, Ohio Northern University, 402 W College Unit 2942, Ada OH 45810

When damage occurs to DNA, repair is crucial for normal cell function. *Rad51d*, which is part of the *Rad51* family, is a gene that plays a vital role in repairing double strand breaks (DSB). The impairment of DSB repair mechanisms causes the loss of genomic stability, which is a forerunner of various cancers. In 2000 a complete knockout of *Rad51d* in mouse embryos was produced but absence of *Rad51d* resulted in embryo lethality. Therefore, in this study, a conditional disruption (CD) concerning the first four exons of the gene was employed for tissue specific studies. The *Rad51d* CD electroporation was utilized to transfect sixteen plates of 10^7 mouse embryonic stem (ES) cells. Partial incorporation of the CD indicated correctly targeted ES cell colonies since these colonies did not take up Geneticin nor FIAU. DNA from these colonies was extracted and run on agarose gel. The DNA was then transferred onto a membrane and hybridized with a 51d 5'2 Forward/Reverse probe containing a P32 label. This membrane was then exposed on x-ray film to detect the presence of bands. A positive result was considered to be the presence of two bands with sizes of 9.4kb (the wild type allele) and 6.4kb (CD). Transfections yielded approximately 180 colonies post-selection, which produced gels that displayed large amounts of extracted DNA. Although all steps prior to Southern blotting had positive results, no bands were seen on the exposed film: therefore the presence and number of correctly targeted colonies could not be determined. Further experimentation will involve numerous manipulations until correctly targeted cell lines are created so that *Rad51d* can be studied in specific tissues.

2:30 DNA FINGERPRINTING OF NECROPHILIC FLIES FOR USE IN FORENSIC IDENTIFICATION.

Sara E. Carroll scarroll19@yahoo.com, (Dr. Britt Bunyard bbunyard@ursuline.edu), Biology Dept, Ursuline College, 2550 Lander Rd, Pepper Pike OH 44124

The identification of necrophilic flies for the use in forensic science is very important in determining time of death. The variance in time of emergence of species allows the entomologist to determine the time of death. Prior analysis of necrophilic flies in a forensic study relied on physical characteristics of the adult fly. By using gene sequencing a forensic scientist can test the larvae and achieve more accurate results in a more efficient manner. Currently there are restriction enzymes known to delineate *Calliphora vicina* from other necrophilic species (including *C. vomitoria, Phaenicia sericata*, and *Sarcophaga* sp.). The object of this research was to successfully identify each species through DNA fingerprinting by using new restriction enzymes. Ten new restriction enzymes were tested, with five (*Mse* I, *Alu* I, *Hpa* II, *Dde* I, *Dra* I) showing potential for segregation among necrophilic fly species. Following PCR amplification of DNA and RFLP analysis, variability was found among the necrophilic fly DNA sequences. After 19 trials, the restriction enzyme *Dra* I was most useful in distinguishing among necrophilic flies. With this new information, it is now possible to identify all common species of North American necrophilic Diptera through DNA analysis in a shorter period of time, making the job for the forensic scientist more expedient.

2:45 EXPRESSION OF SIX NOVEL SRY COPIES FROM THE SHR/AKR RAT STRAIN.

Adam C. Underwood acu1@uakron.edu, Monte Turner, Daniel Ely, and Amy Milsted, Dept of Biology, University of Akron, Akron OH 44325-3908

In mammals, testis determination is initiated by expression of the Sry gene. Sry, which is located on the non-recombining region of the Y chromosome, usually exists as a single copy in most mammalian species; however, in many rodent species including Rattus norvegicus more than one copy can exist. From the rat strain SHR/Akr, six copies of Sry have been identified through screening an SHR/Akr genomic library and PCR amplification of genomic DNA. Each PCR fragment was inserted into the cloning vector pCR$^{\circledR}$4-TOPO$^{\circledR}$ (Invitrogen Corp., Carlsbad, CA). Sequence conservation between copies suggests that each is potentially active. To demonstrate the potential for gene activity, it must be determined if each Sry copy can be transcribed and translated. This investigation followed the hypothesis that multiple Sry copies isolated from male SHR/Akr will exhibit the potential for functionality through transcription and protein expression. Research began by subcloning the coding and 3' flanking regions into the expression vector pcDNA3.1(-) (Invitrogen Corp). Sequence analysis confirmed that each copy (n = 6) was successfully inserted. Next, in vivo (transfection into cultured vascular smooth muscle cells) and in vitro (PROTEINscript$^{\circledR}$-PRO Kit, Ambion, Inc., Austin, TX) transcription and translation techniques were used to express each copy. Analyses utilizing Northern blots and polyacrylamide gel electrophoresis revealed that all six Sry copies are potentially active. Results from this research demonstrate the potential for multiple Sry copy expression, and perhaps provide indications of the possible divergence of copy function.

3:00 Break

3:30 FUNCTIONAL ANALYSIS OF zASIP IN RETINAL DEVELOPMENT.

Scott C. Nelson nelikona@hotmail.com, Xiangyun Wei XiangyunWei@hotmail.com, University of Notre Dame, Dept of Biology, Capital University, Dept of Biology, 2199 E Main St, Columbus OH 43209

The zebrafish retina is a great model to study the molecular mechanisms that control retinal patterning. A previous study indicated that *nagie oko*, a gene involved in maintaining cellular polarity in the retinal epithelium, is also critical for controlling cellular patterning in the retina. This suggested that other polarity genes may also be required for generating the proper cellular organization of the retina. To test this hypothesis, we isolated and investigated the function of the zebrafish gene zASIP, a homolog of the ASIP/Bazooka/Par-3 gene that is conserved from worms to humans. The zASIP protein possesses the same protein binding domains as the other homologues, which suggests that they are involved in assembling similar protein complexes. Functions of zASIP protein during retinal development were studied using morpholino knock-down technology. Morpholinos are modified DNA oligonucleotides that anneal to mRNAs and reduce their translation. Injection of zASIP morpholinos into 1-2 cell zebrafish embryos revealed that the loss of zASIP function disrupted cellular patterning, but not cell specification, in the zebrafish retina. Further experiments utilizing morpholino knock-down of other polarity genes will give more insight into understanding the genetic pathway involved in cellular patterning.

3:45 IMMUNOLOCALIZATION OF FAK IN NGF-TREATED PC12 CELLS.

Sarah E. Meyers Meyers_s@denison.edu (Dr. Catherine N. Smith smithc@denison.edu), Denison University, Slayter Box 1717, Granville OH 43023

Focal Adhesion Kinase (FAK), a 125 kDa non-receptor tyrosine kinase, is known to be important in intracellular signaling cascades and cell

adhesion. Although FAK has been studied in short-term focal adhesion turnover, research into FAK's role in adhesion during long-term neurogenesis has been limited. PC12 cells, a rat pheochromocytoma cell line, provide an ideal system to study FAK, focal adhesions and neurogenesis. PC12 cells can be induced to differentiate into a neuron-like cell and project neurite extensions from the cell body within 24 hours of stimulation with Nerve Growth Factor (NGF). Previous studies from this lab indicate that the levels of FAK protein in PC12 cells after five day stimulation with NGF did not change; however, the amount of activated (phosphorylated) FAK within the cells did increase (Smith and Selickman, unpublished data). In this study, location of both FAK and activated FAK within PC12 cells after a five day stimulation with NGF will be examined by immunocytochemistry and confocal microscopy. Because activated FAK is important in cell adhesion, we hope to observe active FAK located within the neurite extensions, primarily in the growth cones, where it would be important in regulating neurite adhesion and projection.

4:00 ISOLATION AND CHARACTERIZATION OF NOD FACTORS THAT HAVE THE ABILITY TO INITIATE NODULATION ON A RESTRICTIVE *PHASEOLUS VULGARIS* HOST.

Sarah L. Bashore sb332892@ohio.edu and Arthur T. Trese, Dept of Environmental and Plant Biology, 317 Porter Hall, Richland Ave, Ohio University, Athens OH 45701

Soil bacteria in the genus *Rhizobium* are microsymbionts of *Phaseolus vulgaris*. Initiation of the symbiosis begins with the transcription of the *Rhizobium nod* genes that are induced by flavonoids exuded from the plant. These nod genes encode enzymes that synthesize nod factors, lipo-chitin oligosaccharides (LCO's), which are involved in signaling the plant and determining host specificity. We have isolated a spontaneous mutant of *P. vulgaris* that prevents nodulation. Further evaluation resulted in the isolation of 3 strains of *Rhizobium* that have the ability to 'overcome' this mutation and nodulate the mutant plant. The three 'overcoming' strains are believed to produce nod factors with a different chemical structure than the nod factors produced by the other strains, designated 'restricted', within their genus and species designation. Working with both the 'overcoming' and 'restricted' strains, nod factor production was induced with Naringenin and LCO's were isolated using butanol extraction and high-pressure liquid chromatography (HPLC). Bioassay of the nod factors has shown that nod factors of 'restricted' strains do not have the ability to initiate nodulation (root hair curling) on the mutant plant but do on the wild-type plant. 'Overcoming' strain nod factors do have the ability to initiate nodulation on both the mutant plant and the wild-type. This suggests that the 'overcoming' strains of bacteria have novel nod factors that allow them to nodulate the mutant P. vulgaris.

Earth Sciences
09:00 AM, Saturday, April 5, 2003
Brewer/Frost Science 102
Dr. Daniel J. May-Presiding

9:00 FLOATING SAND AND PEBBLES - GARDEN CITY BEACH, SOUTH CAROLINA.

Jack Kovach jkovach@muskingum.edu, Geology Dept, Muskingum College, New Concord OH 43762

In the afternoons of June 23 and 26, 2002, shell fragments up to 8 x 5 x 0.7 mm and sand-sized quartz grains were observed floating on the surface of tidal pools left between tides on the beach at Garden City, SC. The particles floated in irregularly-shaped, elongate to roughly circular, raft-like masses or patches up to 5 cm across and one grain thick. This phenomenon was observed at about 2:00 P.M. Daylight Savings Time on the 23rd and at about 3:00 P.M. DST on the 26th, and documented photographically on each occasion. Both afternoons were sunny and hot (with a high of 31°C) and with winds of 27.8-37 km/hr. The weight of the floating "sand" patches, regardless of their size, produced a clearly visible depression of the water surface beneath each patch. No obvious film of oil or other organic matter was present, and flotation of the particles appears to have been due entirely to the surface tension of the water. The grains [consisting mostly of molluscan shell fragments in the coarse sand (0.5 - 1.0mm) to granule (2.0 - 4.0mm) size range and subangular to well-rounded grains of quartz in the coarse sand and very coarse sand (0.5 - 2.0 mm) size range] were launched by streamlets of water flowing from one tidal pool to another and entraining dry beach sediment. Patches grew by coalescence as they were propelled across the surface of the tidal pools by wind to the opposite bank, where the grains eventually sank as wind speeds increased each afternoon. The full sedimentologic significance of this phenomenon is not known, but it is clear that considerable amounts of sediment can be moved (at least short distances) by flotation on the surface of tidal pools.

9:15 EVALUATING THE SURFACE RECHARGED UNCONSOLIDATED GROUND WATER RESOURCES FOR WILLIAMS COUNTY: A CASE OFR A SOLE SOURCE AQUIFER.

Julie P. Weatherington-Rice weathringtn-rice.1@osu.edu, Bennett & Williams, 2700 E. Dublin-Granville Rd. Ste 400, Columbus OH 43231, Mike Angle mike.angle@dnr.state.oh.us, ODNR Div. of Water, Andy Struble astruble@cityofbryan.com, Bryan Municipal Utilities

Williams County, Ohio, is underlain by a productive, unconsolidated ground-water aquifer system. Historically, it was assumed that the till at the surface was impermeable and that at least half of the aquifers' recharge came from Michigan and Indiana. Recent calibrated ground-water studies (including models) demonstrate that the sand and gravel aquifers recharge locally. This recent discovery has resulted in local activities to protect the documented currently excellent ground water quality. Bryan Municipal Utilities has taken the lead in a locally- and state-based cooperative effort to develop ground water protection strategies, including watershed protection efforts, the creation of a DRASTIC map for Williams County and the petition for a US Environmental Protection Agency Sole Source Aquifer designation. A fully integrated GIS-based DRASTIC map has been completed for Williams County, incorporating numerical modifications to acknowledge the fractured nature of the local soils and glacial deposits. The proposed Sole Source Aquifer delineation boundary identification process included collection of watershed maps for Michigan and Indiana. Utilizing these data sources, a GIS-based, proposed Sole Source Aquifer map for Fulton, Williams and Defiance counties in Ohio and portions of the St. Joseph watershed in Michigan and Indiana has been developed. The new GIS-based maps are presented along with their web-linked addresses. Efforts are currently underway to encourage local governmental support to accompany the petition documentation being developed for the USEPA Region V in Chicago. The full application should be submitted within the next two years.

9:30 RECENT ACTIVITES AROUND, OVER AND IN ABANDONED UNDERGROUND COAL MINES, STARK COUNTY, OHIO.

James R. Bauder jbauder@sssnet.com, BAUDER CERTIFIED EARTH SCIENCES Inc., 6106 Armistice Ave NW, Canton OH 44718

Two adjacent underground coal mines working the same Brookville (No. 4) coal seam were abandoned in 1929 and 1930. These combined mine workings underlie an area larger than 70 acres. To protect the community these mine working were labeled on public maps, known to governmental units and maps of these mine workings were available from the State of Ohio. This area remained as open space and urban development was discouraged over the known underground coal mine workings. Stark County adopted regulations to deny and prevent development over recorded underground coal mines. During the 1970's, subsidence involving a few houses built over the outer limits of one of the mines were corrected by grouting. Other areas contain cave-in depressions up to 8 feet deep. New buildings are not approved over known underground mines except when the owner-occupant agrees in writing that they will hold the County and its employees harmless, and will accept all responsibility for any events growing out of this requested approval is development approved. In the early 1980's, a housing development was built over a portion of this mined area, with full knowledge and approval of the local governmental unit. Subsidence began in the late 1990's, and was corrected by extensive grouting. Recently, an office building was constructed over the abandoned mine working requiring total excavation of mine workings and controlled backfilling with on-site materials.

9:45 WILLIAM. A. KNELLER (1929-2002) — CONTRIBUTIONS TO OHIO GEOLOGY.

Mark J. Camp mcamp@geology.utoledo.edu, Dept of Earth Ecological and Environmental Sciences, University of Toledo, Toledo OH 43606

Dr. William A. Kneller started a geology Dept at the University of Toledo in 1961 and within five years began a graduate program. Evolving from his dissertation work on Michigan Pleistocene sands and gravels, he became interested in the properties of cherts. In 1964, the Ohio Highway Dept, in cooperation with the U.S. Bureau of Transportation, supported his research on the deleterious effects of chert in concrete mixtures used in Ohio's highways. An aggregate lab was established, becoming a center for analysis of concrete construction materials using differential thermal analysis and other techniques. The lab was built from scratch, obtaining and renovating equipment that others discarded. A transmission electron microscope was soon acquired so that microstructure of chert and other aggregate materials could be determined. The Silicate Institute, under the directorship of Wilhelm H. J. Eitel, was made a part of the rapidly expanding Dept of Geology in the mid-1970s. Research on chert resulted in numerous technical reports and papers in various state and regional industrial mineral forums. W.A. Kneller's research turned to coal in the late 1970s; particularly Ohio coal. Within a few years, he established the Dept as a center of coal research in the state. W.A. Kneller became the instrumental figure in Ohio coal characterization studies, investigating

remediation techniques for sulfur-rich seams and finding environmentally safe uses of fly ash by-product from coal-fired power plants. Kneller's students completed eighteen masters theses on Ohio coals and four on the organic-rich Devonian shales. At the time of his retirement in 1989, W.A. Kneller had developed an extensive reference collection of Ohio and North American cherts with accompanying thin sections, Ohio coal pellets, and maceral photographs. They now are housed in the Dept's museum and reference collections. Sadly, William A. Kneller passed away September 13, 2002.

10:00 A CLASSIFICATION SCHEME FOR THE ORIGINS OF GEOGRAPHICAL FOOD NAMES. **Jeffrey J. Gordon jeffgor@bgnet.bgsu.edu, Dept of Geography, Bowling Green State University, Bowling Green OH 43403**

Geographical food names have received scant attention in the professional geographical literature. The goal of this research, building upon my earlier initial work in compiling geographical food names (i.e., the spatial or societal nature of names given to certain foods), was to provide a taxonomy for the origins of geographical food names used in the United States. The hypothesis was that geographical food names are given such appellations because they are inherently helpful in certain ways. Thus far, 879 examples of geographically-named foods have been found. From an etiologic examination and qualitative analysis of this total population, 14 major explanatory classes have been identified. Although unexpected and initially surprising, the resulting large number of classes is reasonable. The classes include: 1. Area of innovation (e.g. Buffalo Wing; Hungarian goulash), 2. Specific environment (e.g. Alaskan snow crab, Brazil nut), 3. Area of significant production (e.g. Vermont maple syrup, Florida orange), 4. Generic environment (e.g. Saltwater taffy, Sun tea), 5. Specific product (e.g. Brussels sprout, Lima bean), 6. Unique preparation (e.g. Chinese fortune cookie, Key Lime pie), 7. Significant differentiation (e.g. New England clam chowder, Manhattan clam chowder), 8. Regional cuisine (e.g., Cantonese, Szechwan), 9. Prime quality (e.g. Colombian coffee, Russian caviar), 10. Authenticity (e.g. Canadian bacon, English muffin), 11. Fanciful spatial association (e.g. Hawaiian pizza, Texas toast), 12. Historic event (e.g. Chicken Marengo), 13. Shorthand designation (e.g., Baked Alaska, French toast), 14. Product identification (e.g., Hershey's chocolate, Quaker oats).

10:15 OHIO SURVEY OF FOOD, AGRICULTURE, AND ENVIRONMENTAL ISSUES. **Jerold R. Thomas thomas.69@osu.edu, Gregory Davis davis.1081@osu.edu, Jeff Sharp sharp.123@osu.edu, Ohio State University Extension, 1219 W Main Cross St, Findlay OH 45840**

The objective of this study was to generate empirical measures of Ohioans' current knowledge, attitudes, and behaviors on emerging and potentially contentious food, agricultural, and environmental issues within the state. A team comprised of individuals in the areas of sociology, agricultural communications, and extension developed the research design in 2001. Six sampling frames based on geography and metropolitan areas were used to allow for spatial comparisons of the 7,976 sampled. Data collection was conducted in the summer of 2002 using Dillman's Tailored Design Method which yielded a response rate of 56.4 percent. Analysis of respondent characteristics indicated the sample was representative of the state population except for: number of renters, respondents aged 18-24 years, and number of African Americans. Results show nearly three quarters of respondents have concerns over the development of large scale poultry and livestock production facilities; nearly three quarters believe such facilities pose a serious threat to water and stream quality; more than one half believe there is a need for increased regulation of such facilities to protect the environment; nearly 40% believe that food is not as safe today as it was ten years ago and that organic foods are safer than conventionally produced food.

10:30 TRENDS AND ISSUES AFFECTING ECONOMIC DEVELOPMENT AT THE COUNTY LEVEL IN OHIO. **Jerold R. Thomas Thomas.69@osu.edu, Ohio State University Extension, 1214 W Main Cross St, Findlay OH 45840**

Little research has been conducted on trends that affect the practice of economic development at the county level in Ohio. This study was conducted in 2001 to determine what issues and trends were affecting local economic development in Ohio through 2005 and to provide information to economic development practitioners and policy makers. A modified-Delphi method was used to collect information. Three rounds of the process involving 13 identified leaders in economic development were completed to obtain the results of the study. Six major trends were identified: A move to a new economy (based on increased technical usage and globalization), increased importance of sustainable and community development, continued importance of existing economic development strategies, workforce development issues, financial incentives, and utility deregulation. Implications included a need for communities to prepare for new economy technologies and infrastructure, a need for economic development practitioners to learn more community and sustainable development skills, an increased competitiveness issue with utility deregulation, and changing workforce development issues. The results of the study have been used by the Ohio Development Association and the Ohio Dept of Development for policy and education planning.

10:45 APPROACHES TO ANALYSIS OF SPATIALLY CONCENTRATED DISEASE. **Richard W. Janson, The Janson Industries, 1200 Garfield Ave SW, Canton, OH 44706. Janson01@aol.com; Lala B. Krishna, Department of Theoretical and Applied Mathematics, University of Akron.**

The Ohio Department of Health along with University Hospitals, Cleveland, Ohio, and the Centers for Disease Control, Alanta GA, are collaborating in a study of the outbreak of West Nile virus in the Cleveland Metropolitan area. The Cleveland Plain Dealer reported in November of 2002 that 1000 residents randomly selected would be given blood tests to ascertain the presence of ahtibodies, whether or not symptoms of the disease were reported or experienced. A series of questions will be part of the study to discover which behaviors contributed to the incidence, such as specified outdoor activities. In addition a geographical component will pinpoint locations that are likely breeding sources of mosquitoes at a county scale, such as parks or swampland areas. Our result is a behavior model and spatial model mathematically appropriate for the analysis of diffusion of disease emanating from multiple sources in a defined geographical space. The Cleveland study is an example of practical and timely significance. The approach outlined in the Plain Dealer has wide potential applications for emerging health threats in a global economy increasingly characterized by urbanization processes that result in giant cities.

Education - Chemistry
02:00 PM, Saturday, April 5, 2003
Brewer/Frost Science 102
Dr. Kenneth A. LaSota-Presiding

2:00 USING CAS STANDARDS AND GUIDELINES AS AN ASSESSMENT TOOL FOR HIGHER EDUCATION PROGRAMS. **Dianne Wright, Ph.D. D_Wright@uakron.edu, College of Education, Dept of Educational Foundations and Leadership, 301-C Zook Hall, University of Akron, Akron OH 44325-4208**

Program guidelines and/or standards are needed for academic programs, particularly those related to advanced study. Programs of study in higher education administration are no exception. Relatedly there should be a clear statement of mission and objectives for any program of study, as well as easily accessible information regarding number and qualifications of faculty, admissions criteria, number of students selected for admission, curriculum and graduation requirements, records of student's persistence, graduation, and job placement. Each higher education administration program director in state of Florida and the state of Ohio was administered an e-mail survey which was computer tabulated by question, by institution. Using SPSS, simple statistics were calculated to determine the extent to which CAS standards were used relative to higher education programs of study. It was hypothesized that CAS standards and guidelines are used as criteria and for purposes of decision making and policy making relative to higher education administration programs in the selected states. It was further hypothesized that this practice is perceived to be used by most other higher education administration program directors in the nation. Survey results failed to reject the null hypothesis. The researcher purports that formal use of CAS or similar standards and guidelines are critical to the future survival of higher education programs.

2:15 COURSES COMMON TO BACHELOR OF NURSING DEGREE PROGRAMS IN WESTERN PENNSYLVANIA. **Kenneth A. LaSota lasota@rmu.edu, Maria Kalevitch kalevitch@rmu.edu, and Daniel Short short@rmu.edu, Dept of Natural Sciences, Robert Morris University, 600 Fifth Ave, Pittsburgh PA 15219-3099**

As part of the process of developing a bachelor of science in nursing degree program, Robert Morris University surveyed 45 colleges and universities within a 150 mile radius of Pittsburgh and found 23 offered the degree. The curricula of the 23 programs were reviewed to determine the number and type of science courses included. Only those science courses offered by the science faculty of the host institution were tabulated. Science courses offered by nursing faculty solely for their own students were not included. Analysis found that all 23 programs required at least one course in anatomy and physiology and while 18 required two such courses. Microbiology was required by 22 of the programs and 16 required a course in nutrition. At least one chemistry course was required by 21 of the programs. Thirteen of the programs utilized a general introduction to chemistry course as its chemistry requirement, while eight utilized a course in bio/organic chemistry as a substitute for general chemistry. Only eight of the programs required a second course in chemistry, an organic chemistry course. Few of the programs required a dedicated course in

pharmacology (six) and only two required a statistics course. For a mathematics requirement, only five programs required a mathematics course that was uniquely designed for the nursing program or was different than the mathematics course of the host institution's general education core. The data collected here may be useful to other institutions designing bachelor of science in nursing degree programs in the western Pennsylvania area.

2:30 SYNTHESIS AND CHARACTERIZATION OF CYANIDE COORDINATION COMPLEXES AS PRECURSORS TO COMPOUNDS WITH MAGNETIC PROPERTIES.

Sayuri C. Matsuura sayuri-matsuura@excite.com, (Paul S. Szalay pszalay@muskingum.edu), 163 Stormont St, New Concord OH 43762

The field of cyanide coordination chemistry has developed over three centuries based on the versatile bridging capabilities of cyanide that were first discovered in Prussian Blue. Despite these efforts, little progress has been reported in the preparation of homoleptic complexes composed of low-valent transition metals and lanthanides and cyanide. These compounds' inner spheres are comprised solely of the ligand, cyanide. The goal of this research is to synthesize coordination complexes of these metals that will be utilized as building blocks in future experiments to create clusters or solid state compounds with magnetic properties. Initially, cyanide salts of potassium, tetrabutylammonium, and thetraethylammonium will be used in reactions with metal starting materials such as gadolinium(III) nitrate and tetrabutylammonium octachlorodirehenate. The resulting coordination complexes' structures and physical properties will be elucidated using UV-Visible spectroscopy, infrared spectroscopy, nuclear magnetic resonance spectrometery, and single crystal X-ray diffraction.

2:45 NUCLEOPHILIC METAL-ORGANIC FRAMEWORKS AND POLYMERS.

Paul Szalay[A] pszalay@muskingum.edu, Matthias Zeller[B], Allen Hunter[B], [A] Muskingum College, Dept of Chemistry, New Concord, OH 43762, [B] Youngstown State University

Research activity in recent years has lead to significant developments in the preparation and chemical property characterization of metal-organic framework (MOF) compounds. This interest stems, in part, from the fact that the pores created in these metal-organic frameworks may be tailored for the inclusion of specific guest molecules. An application may include purification of water through sequestration of metal ion contaminants. Crystalline molecular and solid state metal-organic compounds were synthesized through reactions of solvated transition metal ions with organic ligands that served as linking units. The organic linkers employed were the nitrogen donor macrocycle with dangling acetate groups, 1,4,7,10 – tetraazacyclododecane - N,N',N",N'" tetraacetic acid (DOTA), and tetrabutylammonium 4,4' – diaminostilbene -2,2' disulphonate ($[n\text{-}Bu_4N]_2[DAS\text{-}(SO_3)_2]$). The resulting products were characterized using single crystal X-Ray diffraction and spectroscopic techniques such as infrared spectrophotometry.

Soil - Water - Wetlands
09:00 AM, Saturday, April 5, 2003
Brewer/Frost Science 138
Mr. James J. Hoorman-Presiding

9:00 RAINFALL SURVEY FOR HARDIN COUNTY OHIO (1993-2002).

Gene E. McCluer mccluer.1@osu.edu and James J. Hoorman, Ohio State University Extension, One Courthouse Sq Ste 40, Kenton OH 43326-2399

Cash receipts from marketing crops is 54.5 million dollars per year in Hardin County, Ohio (1997 U.S. Census). Crop production is dependant on rainfall. Rainfall data were collected in a ten-year period (1993-2002) during the growing season (April 15th to October 15th) in fifteen townships and the City of Kenton in Hardin County, Ohio. The purpose was to document differences in growing season rainfall for agricultural producers. Producers could modify crop management practices if significant differences in rainfall exist. The null hypothesis is that there is no difference by township in mean growing season rainfall. Volunteers used one Tru-chek rain gauge per township and city to measure rainfall with .01 inch graduated measurements. Over the 1993-2002 period, the average growing season rainfall was 19.77 inches with a standard deviation of 3.9987 inches for Hardin County. A standard F-test for analysis of variance for mean growing season rainfall by township indicated significant differences with a critical value for comparison (LSD) of 1.99. A Tukey's comparison (using a larger critical value to avoid Type I errors) of mean growing season rainfall by township indicated significant differences with a HSD of 3.45. Using Tukey's, Hale (Southeast) received significantly less rainfall than Lynn, Washington and Jackson townships (North and North Central) and Buck (Southeast) received significantly less rainfall than Lynn township in Hardin County. Knowing significant differences in rainfall per township exist, agricultural producers could modify crop practices (selection of crops and varieties, population, planting date, spacing, cash rents) to maximize crop yields and profit.

9:15 ANALYSIS OF pH LEVELS ON AMISH FARMS IN NORTH CENTRAL OHIO.

James J. Hoorman hoorman.1@osu.edu, Ohio State University Extension, One Courthouse Sq Ste 40, Kenton OH 43326-2399

Three Amish communities in North Central Ohio participated in a United States Dept of Agriculture grant to improve nutrient management. Optimum pH soil test values for most crops in Ohio range from 6.3 to 7.0 for mineral soils (Ohio Agronomy Guide). In a three-year period (1998-2000), 871 soil samples from 89 Amish farms were analyzed for pH using a 1:1 mixture of air-dry soil and de-ionized water. Sample sizes were Belle Center-139, Kenton-587, and DeGraff-145. The null hypothesis is that there is no difference in average pH levels by Amish community. The Belle Center, Kenton, and DeGraff mean pH levels were not significantly different from each other at the 5% level of significance using a standard t-test for mean comparison. One hundred four (11.9%) soil samples tested below a pH of 6.0, low for optimal crop yields. Four hundred forty-one (50.6%) samples tested between a pH of 6.0 and 7.0 (optimum for corn and soybeans) and three hundred twenty-six (37.4%) samples tested greater than a pH of 7.0 (high except for legume hay crops). Associated with low pH levels were fields with no lime, row crops and permanent pastures, and short Amish farm tenure. Associated with high pH levels were fields with high applications of lime, vegetable and hay fields, farms applying a lime by-product from local water treatment plants, and long Amish farm tenure. Since the availability of crop nutrients is influenced by soil pH, proper soil pH on Amish soils is critical for good nutrient management.

9:30 POTASSIUM SOIL LEVELS ON AMISH FARMS IN NORTH CENTRAL OHIO.

James J. Hoorman hoorman.1@osu.edu, Ohio State University Extension, One Courthouse Square, Suite 40, Kenton OH 43326-2399

Using a United States Dept of Agriculture (USDA) grant, three Amish communities in North Central Ohio participated in a soil test program to improve nutrient management. In a three-year period (1998-2000), 871 soil samples were analyzed from 89 Amish farms. Samples were tested for exchangeable potassium (K) by extraction of the soil with ammonium acetate (1 Normal, pH 7.0). Sample sizes were Belle Center-139, Kenton-587, and DeGraff-145. The null hypothesis is that there is no difference by Amish community in average K levels. Using a standard t-test for mean comparison, the Belle Center and Kenton potassium averages were significantly different from the DeGraff potassium average but not from each other at the 5% level of significance. One hundred forty-eight (17.0%) samples tested below 100 Parts Per Million (PPM) K, considered low for optimal crop yields. Five hundred thirty-two (61.1%) samples tested between 100 and 199 PPM K (optimum) and one hundred ninety-one (21.9%) samples tested greater than 200 PPM K (high). Associated with high K were fields planted to vegetable crops and permanent pastures, barn feedlots, fields located close to the barn for manure disposal, and farms with a high ratio of livestock per acre (>1 animal unit/acre). Associated with low K were fields rotated to hay crops, low commercial fertilizer usage, fields with long hauling distances from the barn for manure applications, and farms with a low livestock density (<.5 animal unit/acre). Analyzing Amish K soil levels assists USDA in making recommendations to improve nutrient management and increase water quality.

9:45 ORGANIC MATTER SOIL LEVELS ON AMISH FARMS IN NORTH CENTRAL OHIO.

James J. Hoorman hoorman.1@osu.edu, Ohio State University Extension, One Courthouse Sq Ste 40, Kenton OH 43326-2399

Three Amish communities in North Central Ohio participated in a soil test program to improve nutrient management and water quality. The purpose was to identify Amish cultural practices that enhance organic matter (OM) levels. OM content in most light-colored Ohio soils is between 1.5 and 3.0 percent and OM provides nitrogen, phosphorous, and some micronutrients as OM oxidizes (Ohio Agronomy Guide). In a three-year period (1998-2000), 833 soil samples from 86 Amish farms were tested using the loss on ignition of oven dried soil method. Sample sizes were Belle Center-127, Kenton-561, and DeGraff-145. The null hypothesis is that there is no difference by Amish community in OM soil levels. The Belle Center, Kenton, and DeGraff mean OM levels were not significantly different from each other at the 5% level of significance using a standard t-test for mean comparison. No soil samples tested below 2.0% OM, low for optimal crop yields. Four hundred forty-one (52.9%) samples tested between 2.0% and 3.9% OM (medium) and three hundred ninety-two (47.1%) samples tested greater than 4.0% (beneficial). Associated with low OM were tilled row crop fields, fields located farther from the barn, short Amish farm tenure, and farms with less pasture and hay crops. Associated with

high OM was permanent pasture and hay fields, barn feedlots, fields located close to the barn, vegetable crop fields with high manure applications, and long Amish farm tenure. Amish crop management practices that increase OM soil levels have implications for nitrogen and phosphorous nutrient management and water quality.

10:00 BASEFLOW ANALYSIS OF THE UPPER BLACKLICK CREEK IN CENTRAL OHIO.

Megan A. James mregjames@aol.com, (**Terry Lahm** tlahm@capital.edu), **Capital University, 2199 E Main St, Bexley OH 43209**

The observations of local residents in the northern reaches of Blacklick Creek and the historical evidence of water use to drive mills indicate a possible decrease in overall flow. One possible explanation for the decreased flow is that recent construction in the creek's watershed has increased surface runoff and subsequently reduced infiltration of precipitation to the groundwater system. If this process is occurring, it would cause a reduction in baseflow to the stream. This study analyzes seepage into Blacklick Creek through incremental discharge measurements, using velocity-stream area calculations. Measurements are being taken at four sites over a two kilometer reach of the creek, over two months. Site selection was based on the geologic setting of the area and stream accessibility. This allowed for comparisons between sites and across two stretches of the creek, one overlying a shale bed and the other overlying glacial till. Eliminating possible interference from groundwater usage and discharges to the stream, our study will show the influence of the local geology in these reaches of the stream. Preliminary data indicates a gain in discharge across the shale reach and no gain across the glacial till reach. Conclusions from this study will act as an initial field analysis for future work examining the movement of water within the hydrologic cycle of the watershed.

10:15 DETERMINING THE LT50 OF COPPER AND AMMONIA TO *HYBOPSIS AMBLOPS*.

Rebecca L. Klasen rklasen@capital.edu, (**Tyler Linton** tlinton@glec-oh.com, **Dennis McIntyre** dmcintyre@glec-oh.com), **CU491 Capital University, 2199 E Main St, Columbus OH 43209**

The bigeye chub *(Hybopsis amblops)* is a rare, intolerant fish species in Ohio inhabiting riffles and shallow runs in small to mid-size streams. It is currently not known whether their absence in streams suitable for their occurrence is due to excessive chemical sensitivity, or to some other anthropogenic cause such as siltation/sedimentation. The purpose of this research is to determine the sensitivity of bigeye chub to chemicals in relation to other more commonly tested freshwater fish species, such as the fathead minnow (*Pimephales promelas*). It is hypothesized that bigeye chub are more sensitive than fathead minnows. Chemical sensitivity will be assessed using two common EPA priority pollutants, copper and ammonia. Both of these pollutants are known to be acutely toxic to freshwater fish species at low concentration. Median lethal time to death (LT50) values will be obtained using static exposures. Prior to testing, sexually mature adult bigeye chub captured in the wild will be maintained in the laboratory. If possible, these fish will be bred and the larvae used to initiate the acute LT50 tests. Tests with larvae are desirable as larval life stages are generally more sensitive to chemical pollutants. Research and investigation were needed in the propagation of bigeye chub since there is no information about breeding this species in the laboratory.

10:30 EFFECT OF PLANT SPECIES ON DENITRIFICATION AND METHANE EMISSION IN CONSTRUCTED WETLANDS.

Jamie Smialek[1] smialek.2@osu.edu, **Virginie Bouchard**[1], **Martin Quigley**[2], **Timothy Granata**[3], **Jay Martin**[4], **Larry Brown**[4], **Ohio State University,** [1]**School of Natural Resources and Environmental Science Graduate Program, 2021 Coffey Rd, Columbus OH 43210,** [2]**Horticulture and Crop Science,** [3]**Civil and Environmental Engineering and Geodetic Sciences,** [4]**Food, Agricultural, and Biological Engineering**

Wetlands' ability to retain excess nutrients in waterways at low costs makes them an attractive method of controlling agricultural non-point source pollution. However, it is estimated that wetlands contribute more than 40% of the annual atmospheric methane (CH_4) loading. Vegetation is an important factor in controlling methane emissions by contributing organic matter to the sediments, creating oxidized sediments, and acting as conduits for gas escape into the atmosphere. The objective of this project was to examine how vegetation can be utilized to construct a treatment wetland that has a maximum rate of denitrification and a minimum rate of methane emission. This research was conducted May-November 2002 on a constructed treatment wetland at Waterman Farm on the Columbus campus of Ohio State University. Measurements of CH_4 and CO_2 production and emission, denitrification, plant biomass, and nutrient concentration were estimated in 15 unplanted plots, 15 planted with woody (*Salix*) species, and 15 herbaceous (*Juncus*) plots. Water quality improvement by denitrification was evident along the wetland. At 15 cm below the sediment, CO_2 concentration averaged 7300-9200 ppm, higher than CH_4 (1200-4800ppm). CH_4 concentrations were significantly different between *Juncus* (1200ppm) and *Salix* (4800ppm) species. During evening hours, *Juncus* emission of CO_2 and CH_4 was 3-4 times higher than *Salix*; however, during morning hours *Juncus* species decrease their emission and *Salix* species emit 3-4 times more gas. The selection of specific plants could be used as a design tool in constructed wetlands to limit greenhouse gas emissions.

10:45 VEGETATION IN PASSIVELY REVEGETATED CONSTRUCTED WETLANDS ASSOCIATED WITH AGRICULTURE IN NORTHWEST OHIO.

Lee M. Luckeydoo Luckeydoo.1@osu.edu , **USDA-ARS 590 Woody Hayes Dr, Columbus OH 43210**

Constructed wetlands are increasingly being introduced into the agricultural landscape, primarily for their ability to reduce delivery of non-point source pollutants to streams. Water treatment within a wetland is largely a function of the types/amounts of vegetation present in the wetland. Passively revegetated, constructed wetlands are being monitored for water quality improvement capability at three Wetland Reservoir Subirrigation Project (WRSIS) sites on previously converted cropland adjacent to agricultural fields in northwest Ohio. Quadrat based observational surveys of vascular vegetation were made during 1998-2001 in three zones at each site: the open water zone, a one meter deep zone centered at the waterline (frequently submerged), and the one meter zone above the waterline zone (infrequently submerged). There was a total flora (77 unique species) from all three locations combined. Few species had established in the open water zone. There were similar numbers of annuals (47%) and perennials (49%) of total flora. Wetland indicator species represented 46 %. 85% of the wetland species were native. Dominant species, species with high importance factor (IF) rankings, within the constructed wetlands were most likely from local sources. One of the high IF species, Polygonum persicaria, was a "weed" in local agricultural fields. Four IF species were observed in nearby drainage ditches and streams. Remaining high IF species were supplied from erosion control efforts, for example Medicago sativa and Echinochloa crus-galli, which were seeded onto the top of the banks following construction. Surveys and IF lists suggest planting may expedite vegetation establishment in WRSIS constructed wetlands.

Water Quality and Treatment
02:00 PM, Saturday, April 5, 2003
Brewer/Frost Science 138
Dr. Yung-Tse Hung-Presiding

2:00 ARSENIC REMOVAL FROM DRINKING WATER USING FENTON'S REAGENT AND ZERO VALENT IRON.

Yung-Tse Hung y.hung@csuohio.edu **and Utsav Navnitbhai Somani** utsav22@yahoo.com, **Civil and Environmental Engineering Dept, Cleveland State University, Cleveland OH 44115-2214**

This objective of the study was to determine the removal efficiency of arsenic from drinking water by using Fenton's reagent followed by passage through zero valent iron. Contamination of drinking water by arsenic has received world wide attention. More than 100 million people in the world have been shown to be at risk for consuming arsenic contaminated water. In this study drinking water and groundwater samples were spiked with As^{+3} and As^{+4} using As_2O_3 and arsenic powder respectively. The initial water contained 0.5 to 2.5 mg/L As^{+3}. Results indicated that addition of 300 mg/L Fe^{+2} and 500-750 ¼L/L H_2O_2 reduced arsenic to 20 ¼g/L. In the two-stage treatment system using Fenton's reagent followed by passage through zero valent iron reduced initial As^{+3} of 2.5 mg/L to a final concentration of 10 ¼g/L. In the 2-stage treatment system 100 mg/L Fe^{+2}, 100 ¼L/L H_2O_2 were added and reacted for 10 minutes with raw water followed by passage through the iron scrap at a flow rate of 150 mL/min and then filtered through sand. The 2-stage treatment system can produce treated water meeting U.S. EPA drinking water guideline value of 10 ¼g/L of arsenic.

2:15 EVALUATION OF DRINKING WATER SUPPLIES BY BIOASSAYS.

Yung-Tse Hung y.hung@csuohio.edu **and Amarin Kongtawelert** yankyyod@hotmail.com, **Civil and Environmental Engineering Dept, Howard H. Lo** h.lo@csuohio.edu, **Dept of Biological Geological and Environmental Sciences, Cleveland State University, Cleveland OH 44115-2214**

The objective of the study was to determine the applicability of a bioassay method for determining the toxicological quality of surface water and groundwater. A core battery of bioassays *(Daphnia magna, Hydra attenuata,* and *Lactura sativa* root inhibition test) was tested on each sample. Physicochemical parameters determined consisted of pH, conductivity, total hardness, alkalinity, temperature, turbidity, dissolve oxygen (DO), total suspended solids, total dissolved solids, and chemical oxygen demand (COD). In addition, the algal test using *Selenastrum capricornutum* was conducted for selected water samples. The results were presented as LC_{50}, EC_{50} or IC_{50} values. Natural water samples produced a toxic response in 24% of cases with all three core

bioassays. When all bioassays are considered, the percentage of raw samples showing toxicity with at least one bioassay increased to 60%. Based on the overall rate of responses for the core battery of tests, the *Hydra attenuata* test was the most sensitive, followed by *Daphnia magna*. *Selenastrum capricornutum* was also found to be an efficient and reliable bioassay for toxicity assessment.

2:30 BIODEGRADATION OF PETROLEUM HYDROCARBON GROUNDWATER IN ANAEROBIC COLUMN.

YUNG-TSE HUNG Y.HUNG@CSUOHIO.EDU AND NAGASEKHAR REDDY GORLA REDDYSEKHAR@YAHOO.COM, CIVIL AND ENVIRONMENTAL ENGINEERING DEPT, CLEVELAND STATE UNIVERSITY, CLEVELAND OH 44115-2214, RUTH YU-LI YEH, CHEMICAL ENGINEERING DEPT, MING-HSIN UNIVERSITY OF SCIENCE AND TECHNOLOGY, HSINCHU, TAIWAN

This paper describes a study of a laboratory anaerobic column in bioremediation of petroleum hydrocarbon contaminated groundwater. The objective of the study was to determine the treatment performance of laboratory anaerobic column reactor in removing organic pollutants from the contaminated groundwater. The laboratory anaerobic columns contained aquifer material from a diesel fuel contaminated aquifer. The columns were operated for 65 days at 25°C with artificial groundwater that contained only SO_4^{2-} and CO_2 which served as externally supplied oxidants. After 31 days of column operation, a steady state operation was obtained. For a 14 hour hydraulic detention time, about 0.24 mM SO_4^{2-} were consumed and up to 0.012 mM of dissolved Fe^{+2}, up to 0.06 mM of Mn^{+2}, and up to 0.38 mM of CH_4 were produced. The alkalinity and the dissolved inorganic carbon concentration increased. In the column, *n* -alkanes were selectively removed while branched alkanes persisted. The contaminated aquifer materials had an initial total hydrocarbon concentration of 1410 mg hydrocarbon/kg of dry weight of aquifer materials. During the 65 days column study 200 mg hydrocarbon /kg dry weight of aquifer materials was removed by biodegradation. The hydrocarbon concentration in the liquid effluent of column reactor was 0.64 mg/L at day 55 of the study. Results indicated that the anaerobic column can be used to remove toluene, *p*-xylene and naphthalene from contaminated groundwater effectively.

2:45 BATCH AEROBIC TREATMENT OF A PHARMACEUTICAL WASTEWATER.

YUNG-TSE HUNG Y.HUNG@CSUOHIO.EDU AND RAVI CHAND SUVARNAKANTI RAVISUVARNAKANTI@YAHOO.COM, CIVIL AND ENVIRONMENTAL ENGINEERING DEPT, CLEVELAND STATE UNIVERSITY, CLEVELAND OH44115-2214, RUTH YU-LI YEH, CHEMICAL ENGINEERING DEPT, MING-HSIN UNIVERSITY OF SCIENCE AND TECHNOLOGY, HSINCHU, TAIWAN

This objective of the study was to determine the effect of temperature on the treatment efficiency of COD (chemical oxygen demand) from pharmaceutical wastewater by batch activated sludge reactors and a two stage activated sludge reactors Batch activated sludge reactors were operated at various temperatures from 30 to 70 ÚC. Soluble COD removal efficiency decreased from 62% to 38% as temperature increased from 30 ÚC to 60 ÚC. When temperature was higher than 60ÚC the aerobic biological treatment was not effective. For the two-stage biological treatment process better soluble COD removal was achieved when both reactors were operated at 30 ÚC compared to the 2 stage treatment system where the temperature was maintained at 55 ÚC and 30 ÚC for the first and second stage, respectively. The first 2-stage system (30 ÚC and 30 ÚC) reduced COD from 2800 to 1450 mg/L, while the second 2-stage system (55 ÚC and 30 ÚC) reduced COD from 3650 to 1900 mg/L. The results indicated the maximum temperature for pharmaceutical wastewater treatment was from about 60-65 ÚC. A two stage aerobic treatment system produced a good quality of effluent when both reactors were operated at 30 ÚC compared to a system where the 2 stage reactors were consecutively operated at 55 and 30 ÚC, respectively.

3:00 TREATMENT OF LANDFILL LEACHATE WITH REVERSE OSMOSIS.

YUNG-TSE HUNG Y.HUNG@CSUOHIO.EDU AND RAMA KRISHNA JAVVAJI JRAMAKRISHNA123@REDIFFMAIL.COM, CIVIL AND ENVIRONMENTAL ENGINEERING DEPT HOWARD H. LO H.LO@CSUOHIO.EDU, DEPT OF BIOLOGICAL GEOLOGICAL AND ENVIRONMENTAL SCIENCE, CLEVELAND STATE UNIVERSITY, CLEVELAND OH 44115-2214.

This paper describes the study of landfill leachate by reverse osmosis process (RO). The objective of the study was to determine the treatment efficiency of landfill leachate by membrane processes. Three different types of landfill leachate studied included one leachate from a conventional landfill and two leachates from a biodegradable waste site. Dense, composite RO membrane used in the study had 99% NaCl retention at 0.5 wt % NaCl, 4 Mpa, and 15 ÚC. A linear correlation was found between flux and conductivity for leachate from both the conventional landfill and the biodegradable waste cell. The flux was between 3 and 48 L/m²/h. Membrane fouling by $CaCO_3$ caused reduction of flux. By adjusting pH to below 6.5 membrane fouling was reduced and the flux of leachate from biodegradable waste cell could be maintained above 35 L/m²h. The RO membrane removed more than 98% of COD (chemical oxygen demand), and NH_4-N from leachate from both the conventional landfill and the biodegradable waste. The salt concentration and also the osmotic pressure were very high for leachate from the cell containing special waste. The flux was too low for effective RO treatment for this type of leachate.

3:15 BATCH AND CONTINUOUS REACTOR TREATMENT OF BLACK LIQUOR FROM PULP AND PAPER MILL WASTEWATER.

YUNG-TSE HUNG Y.HUNG@CSUOHIO.EDU AND SAI SRINIVAS KUMAR PEDDIBOVINA SAISRINIVAS33@YAHOO.COM, CIVIL AND ENVIRONMENTAL ENGINEERING DEPT, CLEVELAND STATE UNIVERSITY, CLEVELAND OH 44115-2214

This paper describes a study on the treatment of black liquor from a kraft pulp and paper mill using batch and continuous biological reactors. The objective of the study was to determine the removal efficiency of COD (chemical oxygen demand) from black liquor from a kraft pulp and paper mill wastewater by biological treatment processes using *Aeromonas formicans*. Batch and continuous activated sludge reactors were used in the study. Compressed air was used for mixing and for providing dissolved oxygen for bio-oxidation in the reactors. The black liquor had 11.36 pH, 5400 mg/L COD, 7640 color unit, 2.18 mg/L lignin. The results of batch studies showed that the strain, *Aeromonas formicans*, removed 71% of COD and 78% of lignin, and 86% color during 10 days of hydraulic detention time. The removal efficiency of COD, color and lignin obtained in continuous reactor studies was 73, 88, and 77%, respectively, during 8 days of hydraulic detention time. First order kinetics was observed for COD, color and lignin removal. The kinetic coefficient, k, was 0.43, 0.60, and 0.55 day^{-1} for COD, color, and lignin, respectively. A linear relationship was observed between COD and lignin removal efficiency, and between color and lignin removal efficiency. Results indicated that the bacterial strain used in the study was effective in removing COD, color and lignin from black liquor in pulp and paper mill wastewater.

3:30 EFFECTS OF HEAVY METAL ON ACTIVATED SLUDGE TREATMENT PROCESS.

YUNG-TSE HUNG Y.HUNG@CSUOHIO.EDU AND MAJID ZARRINAFSAR, CIVIL AND ENVIRONMENTAL ENGINEERING DEPT, HOWARD H. LO H.LO@CSUOHIO.EDU, DEPT OF BIOLOGICAL GEOLOGICAL AND ENVIRONMENTAL SCIENCES, CLEVELAND STATE UNIVERSITY, CLEVELAND OH 44115-2214, RUTH YU-LI YEH, CHEMICAL ENGINEERING DEPT, MING-HSIN UNIVERSITY OF SCIENCE AND TECHNOLOGY, HSINCHU, TAIWAN

This paper describes the investigation of the effect of selected heavy metals on the treatment performance of activated sludge process. Oxygen uptake rates were measured and heavy metal speciation was determined by the dialysis method. The extracellular polymer of biomass floc was determined by biochemical analysis. The affinity series of the metals in the sludge flocs was: Cu> Cd> Co > Ni> Sb> Zn . In the case of extracted polymer: Cu> Ni> Cd> Co> Sb> Zn. Copper was the metal bound most strongly by activated sludge flocs, followed by Cd, Co and Ni. The oxygen uptake measurements were conducted at two concentrations of 1 and 10 mg/l of heavy metal concentration and at 3 levels of MLVSS (mixed liquor volatile suspended solids) of 600, 900 and 1500 mg/L. Duplicate measurements were made. Results indicated that 1 mg/l Co and Sb and 10 mg/l Zn were the most inhibitory to the activated sludge process. Zn was not inhibitory at the MLVSS concentrations investigated. The inhibitory effect of Ca, Co and Zn and Sb decreased as the MLVSS concentration increased.

3:45 MICROTOX BIOASSAY OF FOUNDRY SAND RESIDUALS.

YUNG-TSE HUNG Y.HUNG@CSUOHIO.EDU AND ZHIGUO JIANG Z.JIANG1@CSUOHIO.EDU, CIVIL AND ENVIRONMENTAL ENGINEERING DEPT, HOWARD H. LO H.LO@CSUOHIO.EDU, DEPT OF BIOLOGICAL GEOLOGICAL AND ENVIRONMENTAL SCIENCES, CLEVELAND STATE UNIVERSITY, CLEVELAND OH 44115-2214

The purpose of this paper is to describe the application of a bioassay in assessing the toxicity of foundry sand residuals. The objective was to determine whether Microtox method can be used effectively in determining the toxicity of foundry sand residuals. Microtox bioassays were performed on leachates derived from foundry sand residuals. Virgin sand samples were used to establish a benchmark against which the waste foundry sands could then be compared with respect to toxicity. pH and COD (chemical oxygen demand) were determined for the leachates. The pH was about 6.9 for leachate from virgin sand. The pH was from 6.5 to 10.1 for leachate from iron greensand foundry residual. For chemically bound waste foundry residual leachate the pH was from 6.8 to 7.3. The soluble COD for virgin sand leachate was from 2 to 24 mg/L. The soluble COD for foundry sand leachate ranged from 25 to 210 mg/L. The nature of pollutants were mainly organic in nature. The results indicated a correlation between higher levels of bioassay inhibition and leachate soluble COD. The pH in the leachate was higher than that from virgin sand and it may cause bioassay inhibition at the high pH values.

4:00 BIOREMEDIATION OF SOIL CONTAMINATED WITH EXPLOSIVES.

Yung-Tse Hung y.hung@csuohio.edu and Sudheer Gubba gusudheer@hotmail.com, Civil and Environmental Engineering Dept, Cleveland State University, Cleveland OH 44115-2214, Ruth Yu-Li Yeh, Chemical Engineering Dept, Ming-Hsin University of Science and Technology, Hsinchu, Taiwan

This paper describes a study on the remediation of explosive contaminated soils by biodegradation processes. The objective was to determine the efficiency of biological treatment methods in removing organic pollutants from the explosive contaminated soils. Explosive contaminated soil can be treated with bioremediation, phytoremediation, solidification and stabilization, electrode assisted soil washing, treatment of organic waste using biopiles, membrane technologies, and surfactant enhanced treatment technologies. The biological treatment processes described in this study included soil slurry reactor and soil columns. The soil used in this study had an organic carbon content of 4 to 5%. Soil columns used in the study contained soil of effective size of 0.1 mm and a uniformity coefficient of 4.3. Soil used in the study was mainly contaminated with 4000 to 12,000 mg TNT (2,4,6-trinitrotoluene)/kg soil, 6 to 12 mg NO_3/kg soil. The soil slurry reactors were operated with 15% (w/v) TNT contaminated soil. Molasses was used as a co-substrate to enhance bacterial growth in both soil slurry reactor and soil column. Results indicated that after 4 months of treatment in a slurry reactor, the TNT metabolite concentration was less than 20 mg/kg. For the soil column the TNT was reduced to 0.5 mg/kg after 305 days of treatment from the initial TNT concentration of 3839 mg/kg. Soil slurry reactor was found to be an effective method for remediation of explosive contaminated soil.

4:15 BIOLOGICAL TREATMENT OF EXPLOSIVE CONTAMINATED WASTEWATERS.

Yung-Tse Hung y.hung@csuohio.edu and Muhammad Musa Mer'eb mereb7@yahoo.com, Civil and Environmental Engineering Dept, Cleveland State University, Cleveland OH 44115-2214

This paper describes a study on the treatment of explosive contaminated wastewaters by biological treatment processes. The objective of the study was to determine the removal efficiency of organic pollutant from explosive contaminated wastewater by biological treatment method. Treatment methods of explosive contaminated wastewaters consists of biological treatment processes and physico-chemical treatment processes, which include activated carbon adsorption and UV destruction. A two-stage treatment system consisting of anoxic reactor followed by aerobic reactor was used in the study. The anoxic stage was used to remove nitrate by denitrification, while the aerobic stage is used for organic pollutant removal by aerobic bacteria. The raw wastewater had 150 mg/L DOC (dissolved organic carbon), 25 mg/L RDX (hexahydro-1,3,5-nitro-1,3,5-triazine), and 450 mg/L nitrate. Fill and draw mode was used in the study. The hydraulic detention time was about 10 days in both anoxic and aerobic reactor. The sludge age was longer than 30 days for both reactors. MLVSS (mixed liquor volatile suspended solids) was 760 and 2680 mg/L in the anoxic and aerobic reactor, respectively. Results indicated that the anoxic reactor effluent contained 350 mg/L DOC, 1.1 mg/L nitrate, 2.1 mg/L nitrite, and 7.4 mg/L RDX. The aerobic reactor effluent contained 60.8 mg/L DOC, 1.7 mg/L nitrate, 1.8 mg/L nitrite, and less than 0.5 mg/L RDX. The 2-stage biological treatment process was effective in removing pollutants from explosive containing wastewaters.

4:30 FOOD WASTEWATER TREATMENT BY CHEMICAL COAGULATION.

Howard H. Lo h.lo@csuohio.edu, Biological Geological and Environmental Sciences Dept, Madhavi Latha Batchu madhusmile@yahoo.com, and Yung-Tse Hung y.hung@csuohio.edu, Civil Engineering Dept, Cleveland State University, Cleveland OH 44115-2214.

This study is to determine the effectiveness of various coagulants on the removal of organic pollutants from food wastewater. Standard jar test was used in the laboratory experiment. The procedures included one minute for rapid mixing, followed by 30 minutes of slow mixing and one hour settling. Supernatant was taken for determination of turbidity and TOC (total organic carbon) tests. Turbidity was measured by turbidity meter and TOC was determined by TOC analyzer. gated: potato wastewater, sugar wastewater, and combined potato/sugar wastewater. The experimental parameters used in this study including three organic strength of wastewater and types and dosage of coagulant. Three organic strength of food wastewater consisted of 50, 125 and 200 mg/L TOC. The coagulants used included aluminum sulfate, ferric sulfate, and ferric chloride with dosages of 2, 4, 6, 8, and 10 mg/l. The lowest turbidity of treated wastewater was 2, 10, and 25 TU (turbidity unit) with aluminum sulfate, ferric sulfate, and ferric chloride as coagulant. It was found that the low organic strength wastewater had a higher turbidity removal efficiency than the medium and high organic strength wastewater. The highest percentage of TOC removal for aluminum sulfate, ferric sulfate, and ferric chloride were: 89, 88, and 95%, respectively. The results of this study showed that the ferric chloride had the best TOC removal efficiency, and the aluminum sulfate had the highest rate of turbidity removal among the three types of coagulants used in the study. The low organic strength wastewater had a better TOC and turbidity removal efficiencies than the medium and high organic strength wastewater. The general trend indicated that as the organic strength of wastewater increased the removal efficiency of TOC and turbidity decreased.

4:45 THE SECTION 404 OF THE CLEAN WATER ACT AND MITIGATION ACTIVITIES IN NORTHERN OHIO.

Emmanuel K. Mbobi embobi@stark.kent.edu, Dept of Geography, Kent State University Stark, 6000 Frank Ave NW, Canton OH 44720

Section 404 of the Clean Water Act regulates the discharge of dredged and fill material into waters of the United States, including wetlands. The basic premise of the program is that no discharge of dredged or fill material can he permitted if a practicable alternative exists that is less damaging to the aquatic environment. As a result, steps must be taken to avoid wetland impacts where practicable, a minimization of potential impacts to wetlands, and compensation provided for any remaining, or unavoidable impacts through mitigation and therefore maintaining a "No Net Loss" of wetlands. This paper examines the Section 404 permit system and mitigation in some Northern Ohio counties. This study attempts to determine if proposed mitigation is adhered to after the Section 404 permit process. Data from six Northern Ohio counties (Lucas, Ottawa, Wood, Portage, Summit and Stark) were obtained from the Army Corps of Engineers (ACOE) and examined. The data includes applications received, those issued, those that were denied, applications that were withdrawn, the acreage requested, the number authorized and proposed mitigation between 1990 and 2001. According to the data, these counties requested the filling of 283.5 acres, the ACOE approved 238.4 acres for filling, and 586.82 acres were proposed for mitigation. The mitigation data is unavailable from the ACOE due to the lack of sufficient manpower to collect the information. Monitoring of mitigation activities is conducted by private environmental organizations within the state of Ohio. Mitigation data is obtained from a private environmental company and indicates that 51.3 acres of wetlands have been mitigated since 2000 through wetland banking. Data from 1990 to 2000 are unavailable.

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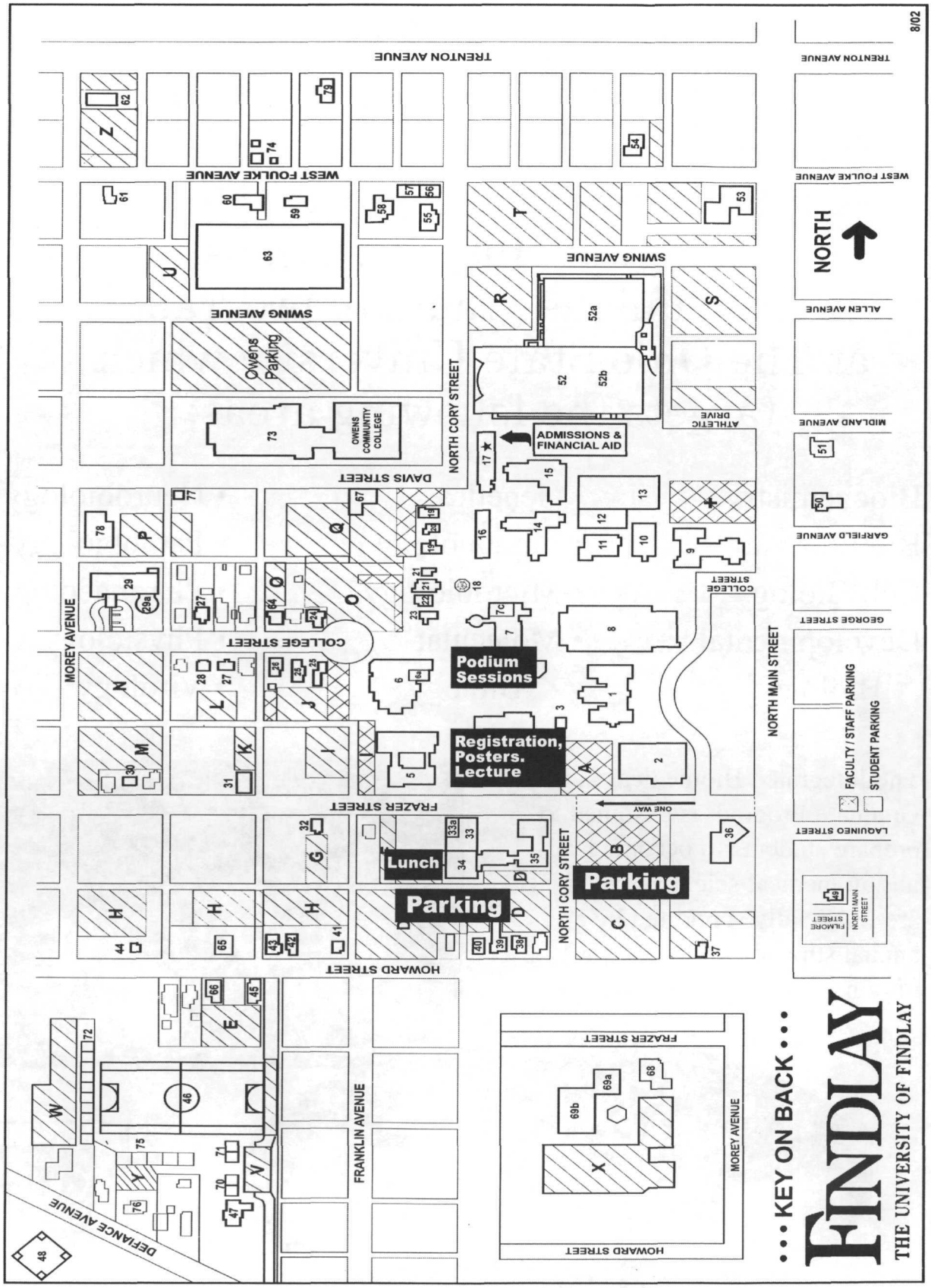
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Key

1	Old Main
2	Shafer Library
3	Union Gazebo
4	*Alumni Memorial Union*
5	Frank J. Egner Center for the Performing Arts
6	Virginia B. Gardner Fine Arts Pavilion
7	William B. Brewer Science Hall
7a	Kenneth L. Frost Science Center
8	Croy Physical Education Center
9	College First Church of God
10	Renninger Gym
11	Phil Gardner Fitness Center
12	Basketball Courts
13	Tennis Courts
14	Fox Residence Hall
15	Bare Residence Hall
16	Myers Residence Hall
17	Morey Residence Hall
18	North Cory Street Gazebo
19	Faculty Offices – Humanities
20	Faculty Offices – Computer Science
21	Faculty Offices – Teacher Education
22	Faculty Offices – Math
23	Faculty Offices
24	Faculty Offices – Graduate Programs
25	International Affairs
26	Offices of Career Placement, Student Employment and Professional Experience Programs
27	Faculty Offices – Physical Therapy
28	Faculty Offices – Occupational Therapy
29	Edward and Joyce Brewer Center for Health Sciences
29a	W. Robert and Marilyn Y. Brewer Lecture Hall (BCHS100)
30	Faculty Offices – Physician Assistant
31	Nature Center
32	Bucher Center/Counseling Services
33	Deming Residence Hall
33a	Rosewood Room
34	Henderson Dining Hall
35	Lovett Residence Hall
36	Winebrenner Theological Seminary
37	Faculty Offices – History & Political Science
38	Offices of Degree Completion Programs
39	Ceramics
40	ITS – Help Desk
41	*Student Housing*
42	Student Housing
43	Sigma Kappa Sorority House
44	Alpha Sigma Phi Fraternity House
45	Student Housing
46	Soccer Field
47	Honors House
48	Swale Park
49	Tau Kappa Epsilon Fraternity House
50	Carrothers Home/Residence of the President
51	Theta Chi Fraternity House
52	Ralph and Gladys Koehler Fitness and Recreation Complex
52a	Wilbur and Maxine Clauss Ice Arena
52b	Robert A. Malcolm Athletic Center
53	University Bookstore
54	Dr. Frank R. and Mary Jane Cosiano Health Center
55	Glenn and Helen Stout Alumni Center
56-59	Student Housing
60	Physical Plant Office
61	Student Housing
62	Nuclear Medicine Institute
63	Frederick Kremer Jr. Memorial Field
64	Faculty Offices
65-66	Student Housing
67	Teaching, Learning and Technology Center
68	Faculty Houses
69a	Marilyn and Gordon Macklin Intergenerational Institute
69b	Winebrenner Residence Hall
70	Zahler Townhouses
71-72	University Townhouses
73	*Owens Community College Findlay Campus*
74	Physical Plant Shipping & Receiving
75	University Townhouses
76-77	Student Housing
78	Physical Therapy
79	Occupational Therapy

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From Toledo, Michigan, Canada
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- I-75 south to Findlay, Exit 159
- Left (east) on US 224
- Right on Morey Ave.
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From Cleveland, Northern PA, New York
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- Left on Davis St.

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- Right (north) on Main St.
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- Right on Morey Ave.
- Right on Davis St.

From Dayton, Cincinnati, Kentucky
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- Left on Davis St.

From Fort Wayne
(Approximately 2 hours from Fort Wayne)
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- Indiana Toll Road (I-80, I-90 east) to Ohio Turnpike
- Ohio Turnpike east to I-75 south at Toledo
- I-75 south to Findlay, exit 159
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- Right on Morey Ave.
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- US 23 north to SR 15 west (to Toledo)
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- Left on Davis St.